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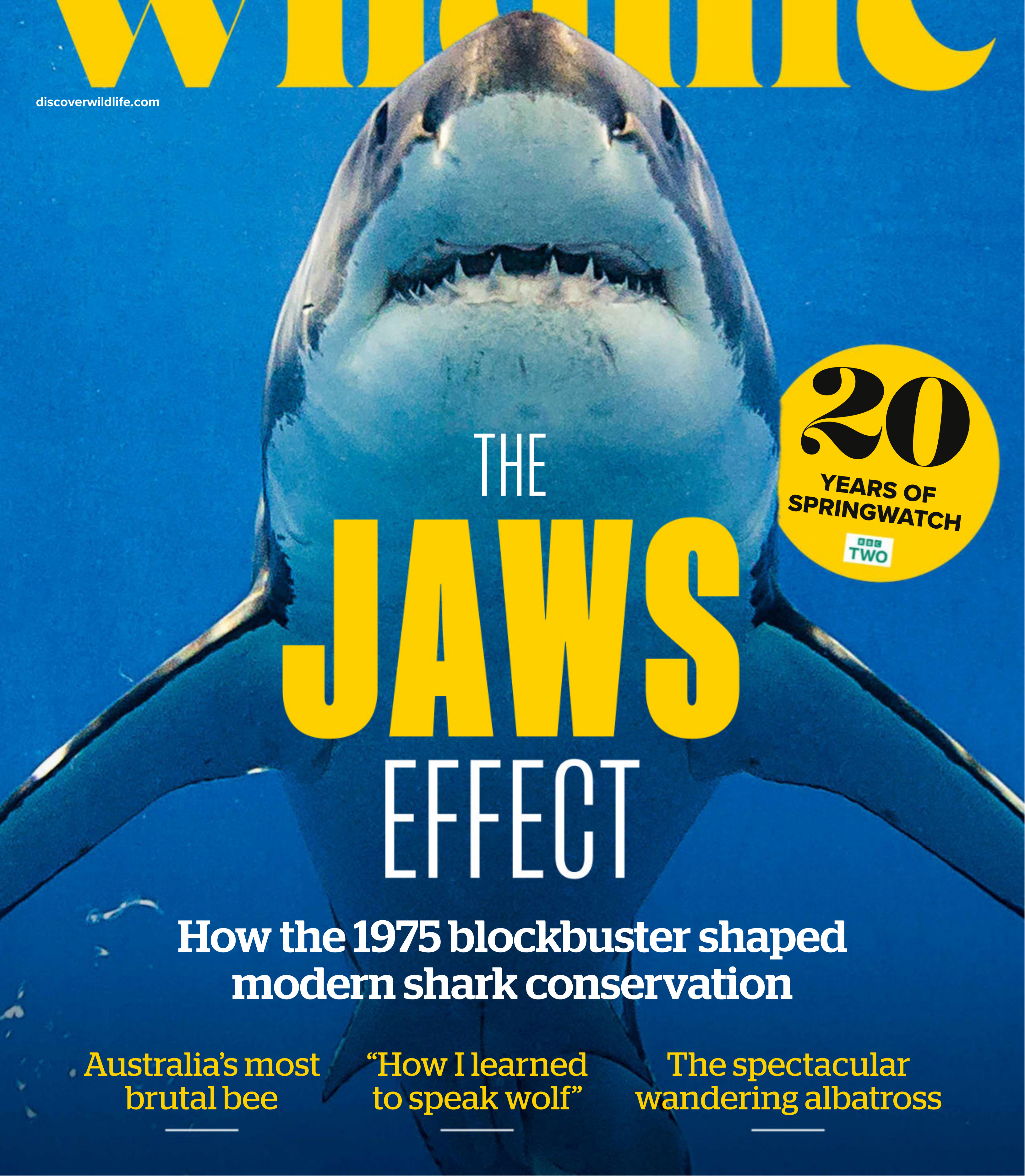


20 YEARS OF SPRINGWATCH
BBC TWO

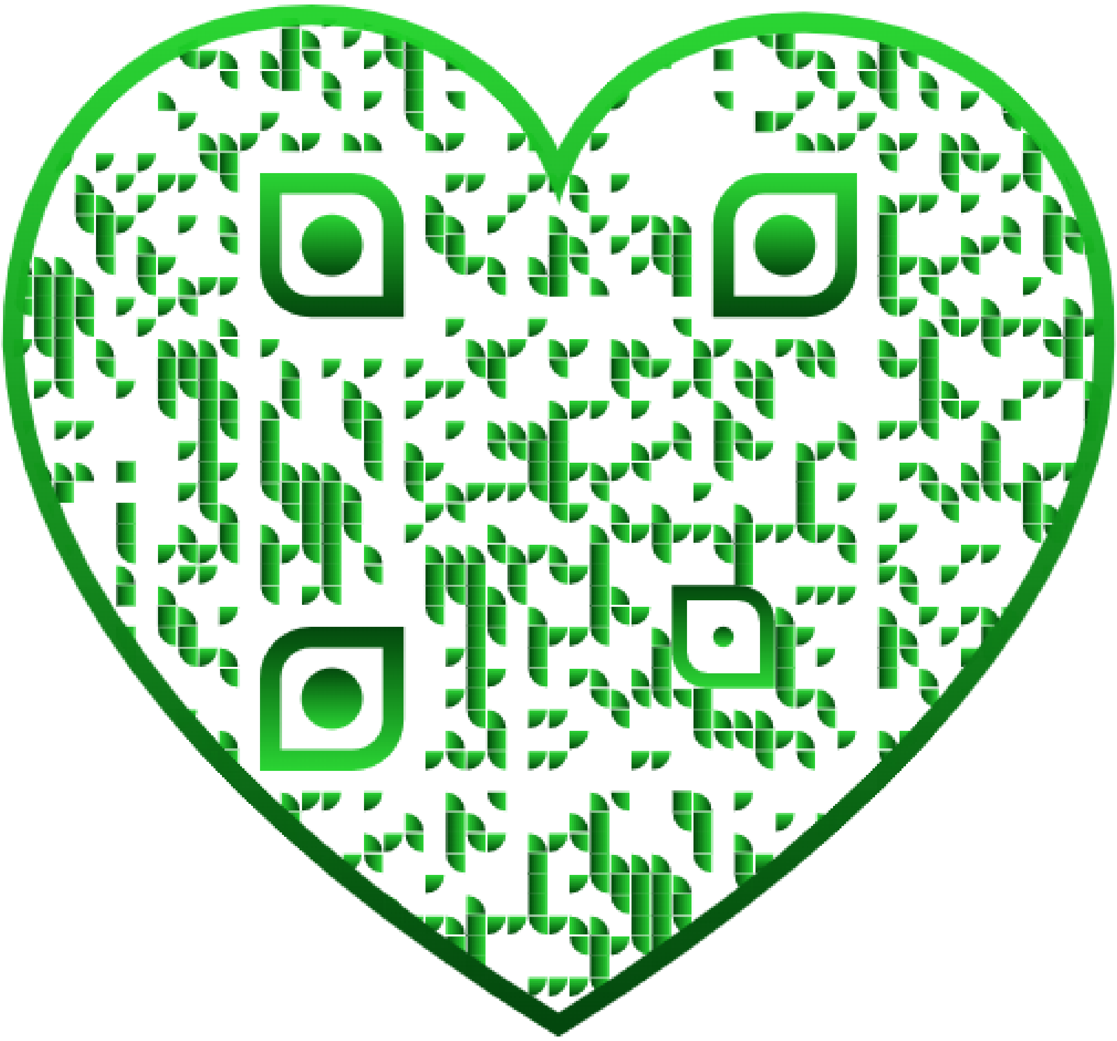
THE JAWS EFFECT

How the 1975 blockbuster shaped modern shark conservation

Australia's most brutal bee

"How I learned to speak wolf"

The spectacular wandering albatross



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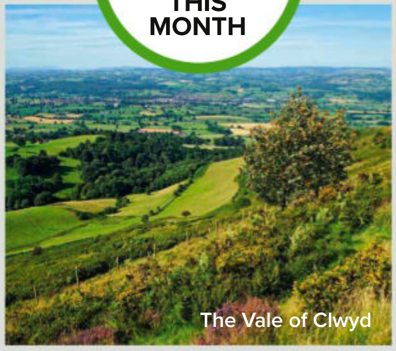
The Vale of Clwyd

Iolo's River Valleys

Iolo Williams explores four of Wales's most stunning river valleys from sea to source, uncovering their hidden wonders and remarkable wildlife, including wild beavers in the Dyfi Valley and rare butterflies in the Vale of Clwyd.
Catch up on iPlayer

The Eden Project

BBC Teach Live Lessons

In a special episode to coincide with Earth Day, hosts Naomi Wilkinson and Lizzie Daly explore the rainforest biome at Cornwall's Eden Project to find out how the water cycle is essential to sustaining life on our planet.
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Unexpected Elements

This engaging science series, which helps you see the world in a new way, turns its attention to eggs – including a look at how climate change is affecting the breeding patterns and nesting behaviour of sea turtles.
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THE VALE OF CLWYD: NATURE PICTURE LIBRARY/ALAMY; GREAT WHITE SHARK: BRIAN SKERRY/MINDEN/NATUREPL.COM

Great white shark near Australia's Neptune Islands

Jaws may be a great movie, but its legacy needs a refresh

PAUL McGUINNESS, EDITOR

Sharks are more than 400 million years old, but the last 50 years have been perhaps the worst they've ever known. Can this all be down to a movie?

A few years ago, I was interviewing Steve Backshall about sharks. Of the many fascinating things he had to say about them, one thing I'd never considered really stayed with me: "Before *Jaws*, the knowledge of what a shark was, was almost nothing," he told me. "People had probably seen a little bit of sharks from the documentary *The Silent World* and Cousteau but not much else. And then all of a sudden, this great Hollywood blockbuster comes along and it defines a lot of people's perceptions of what a shark is."

It left sharks with a reputation as malevolent killers, whereas in fact millions are slaughtered around the globe every year. Isn't it time these ancient animals had an image change?

Paul

BBC wildlife

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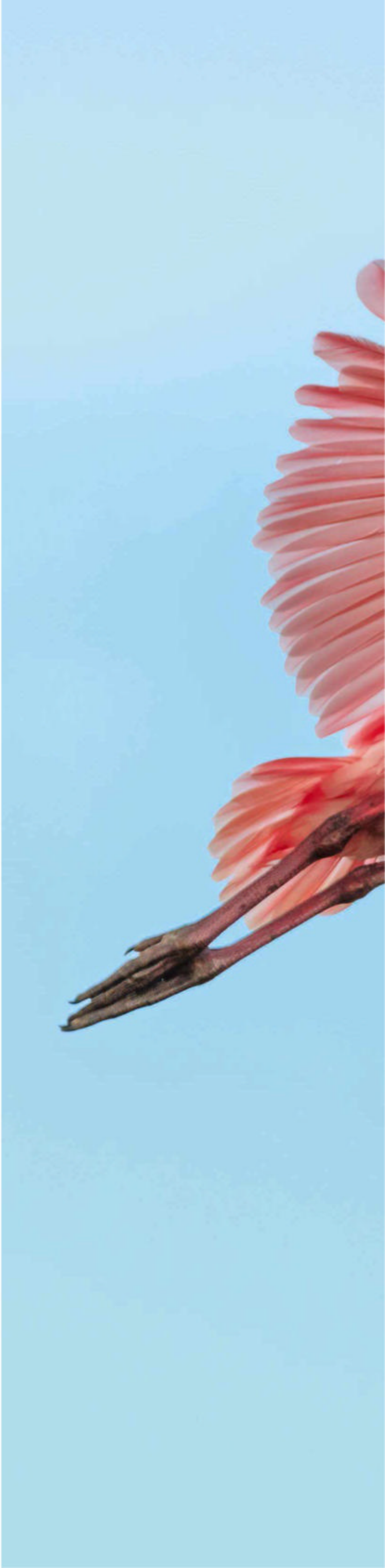

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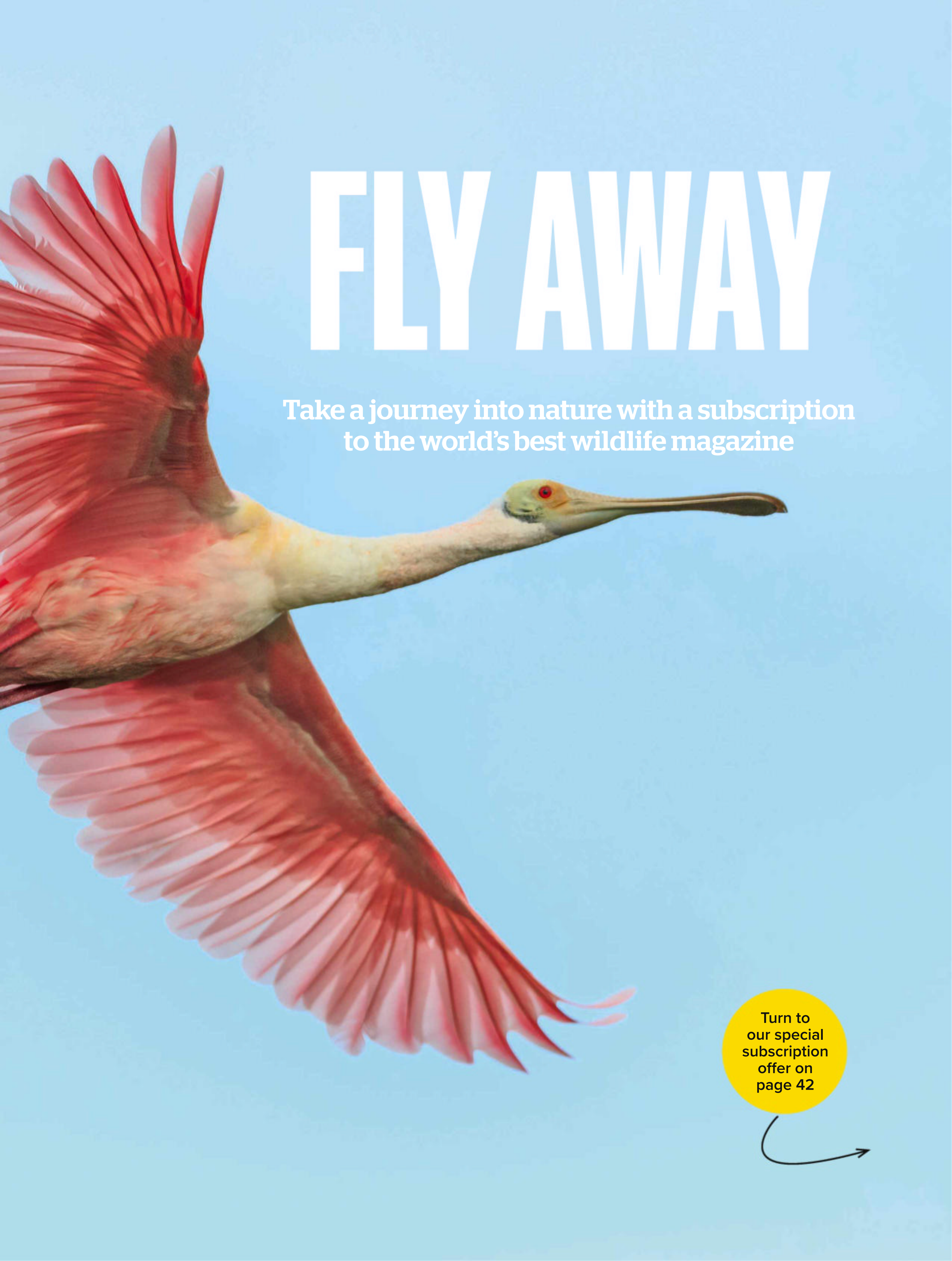
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20 YEARS OF SPRINGWATCH
THE JAWS EFFECT
How the 1975 blockbuster shaped modern shark conservation
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THE COVER

Our cover star this month is a great white shark swimming towards the surface of the Pacific off Mexico's Guadalupe Island. White shark populations are frequently found in temperate coastal waters that have an abundance of fish and marine mammals. *See p54*

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The savage life of Dawson's burrowing bees

GREAT WHITE SHARK (ON COVER): WILDESTANIMAL/GETTY; BURROWING BEES: GEORGINA STEYTLER; DEER: DPA PICTURE ALLIANCE/ALAMY; CHOUGH: JAKE STEPHEN/GETTY; YOUNG CHIMPANZEE: FIONA ROGERS/GETTY

Every month, only in *BBC Wildlife*

NICK BAKER
"These peculiar birds were horned screamers. It turns out they are odd on both the outside and the inside." *p38*

GILLIAN BURKE
"As I watch all these creatures getting on with the business of staying alive, for a blissful moment, I simply exist." *p27*

MARK CARWARDINE
"I believe we environmentalists have been tilting steadily towards political crisis for some time." *p30*

LUCY COOKE
"This all-female lineage has been thriving for millions of years by cloning and occasionally even stealing DNA." *p29*

MIKE DILGER
"During the wandering albatross's breeding season, just one foraging flight can cover up to 16,000km." *p34*

DAVID LINDO
"I heard a loud crashing in the bushes and was aware of being in the presence of a large, unseen animal." *p33*

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The remarkable project to save fawns

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In June, you can see families of choughs tumbling in the air along the coast
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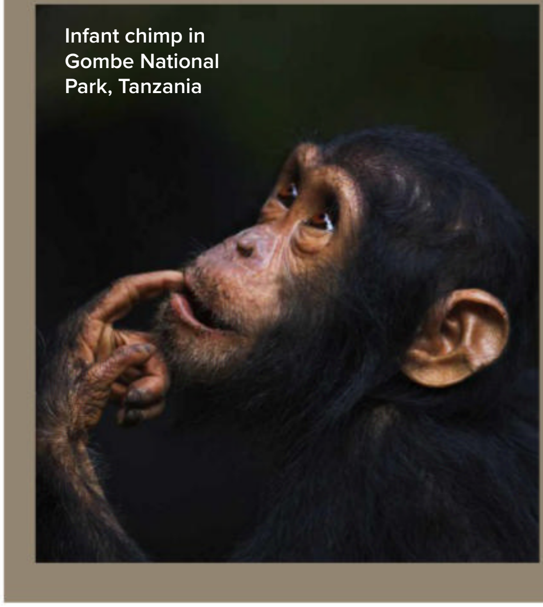

Infant chimp in Gombe National Park, Tanzania

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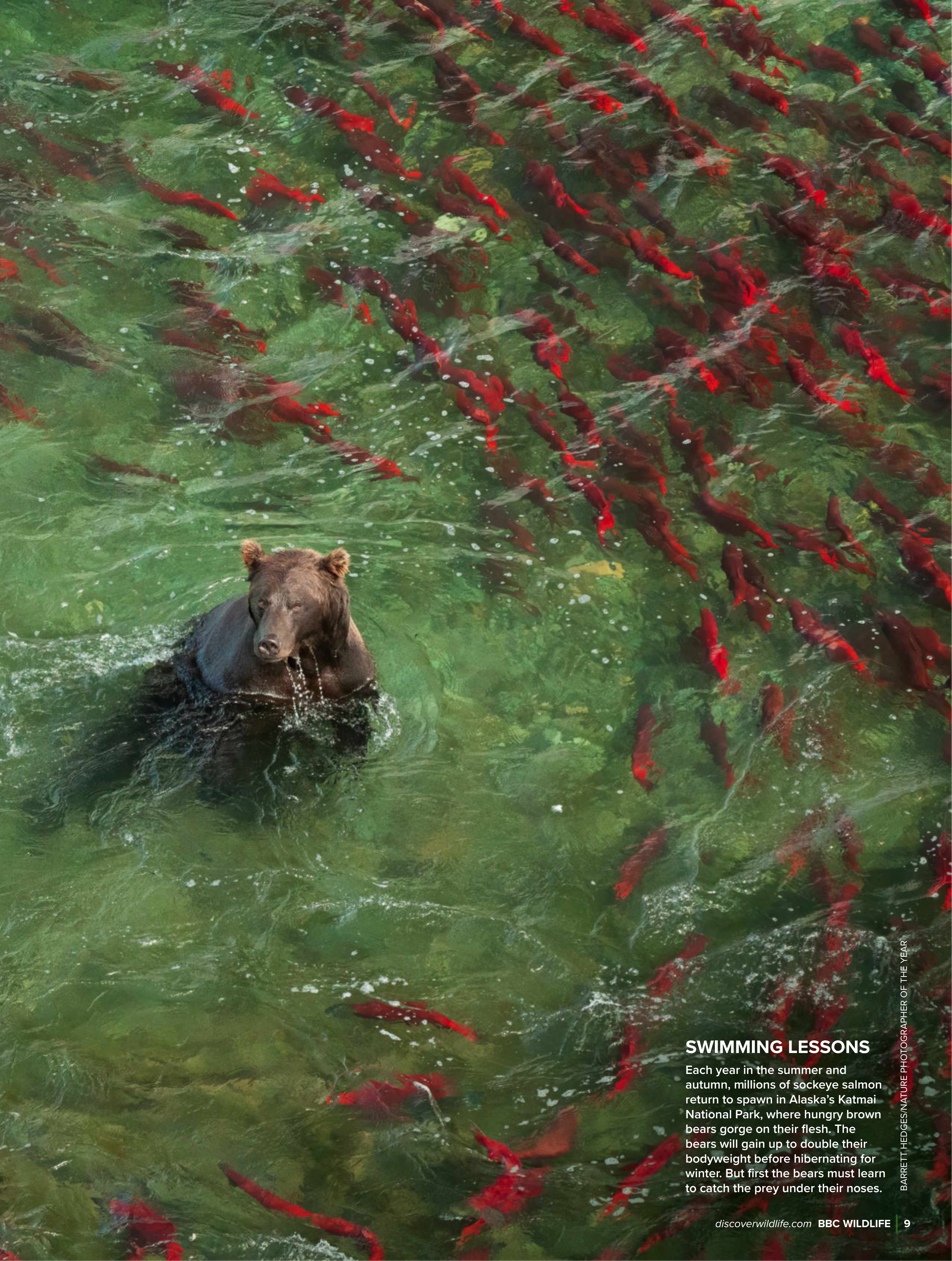
wild TIMES

The latest news, photography and seasonal wildlife highlights



SWIMMING LESSONS

Each year in the summer and autumn, millions of sockeye salmon return to spawn in Alaska's Katmai National Park, where hungry brown bears gorge on their flesh. The bears will gain up to double their bodyweight before hibernating for winter. But first the bears must learn to catch the prey under their noses.

BARRETT HEDGES/NATURE PHOTOGRAPHER OF THE YEAR

EVOLUTIONARY LEAP

Jumping spiders normally move slowly – they only leap in response to a threat. There are almost 6,000 species, including 150 in Ecuador's Yasuní National Park, where this specimen was photographed. Unusually in spiders, their four eyes give them stereoptic colour vision, allowing them to perceive depth.

ALEX HYDE/NATUREPL.COM

Lesser goldfinches are moving north

Warmer temperatures are leading these irrepressible golden-hued birds to expand their range in the USA

Lesser goldfinches were once restricted to the south-western portions of the United States – they are common in California and Texas. The birds are present in areas of Arizona, Colorado and New Mexico and range into Central America as well. Now, the warming climate is pushing them north in significant numbers.

A new study in the journal *Ornithology* has found that lesser goldfinch populations have grown in states where the species was previously uncommon. According to observations from FeederWatch and eBird, coordinated by the Cornell Lab of Ornithology, numbers of lesser goldfinches have increased substantially in north-western states – growing as much as 110 per cent in Washington and 66.3 per cent in Idaho between 2012 and 2022. Populations are booming in Oregon too.

"I was seeing groups of 30 or 40 at a time and I assumed that was normal," says lead author Mason Maron (a graduate in wildlife ecology and conservation sciences) of his early observations in Washington. Maron learned from local birders that this was a recent development – even a decade earlier, these finches were unheard of in the state.

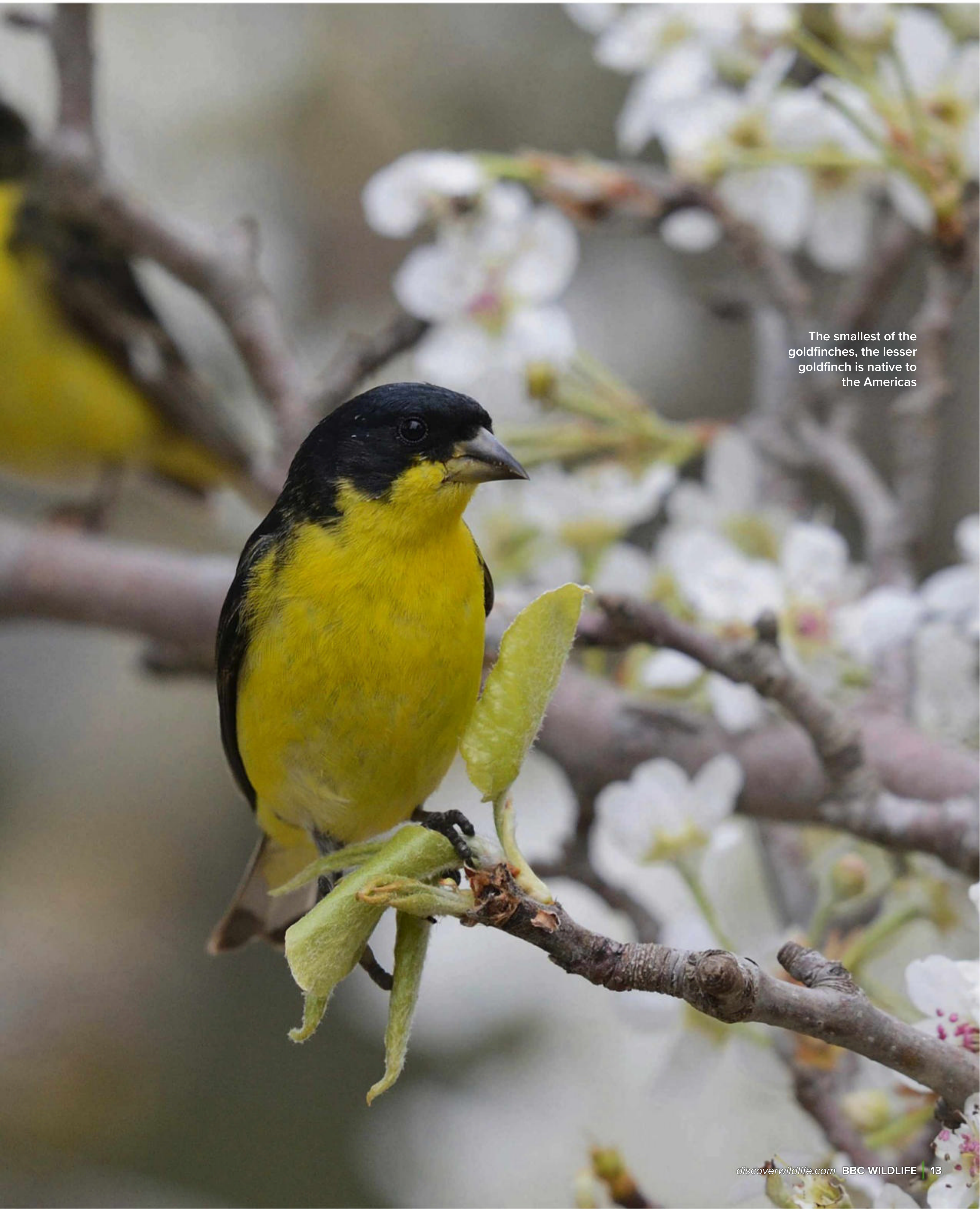
The birds appear to be following rivers northwards, cued by warming temperatures and increased rainfall. These corridors offer an abundance of food from weedy plants that thrive along the edges of the waterways. Urban development also appears to be encouraging colonisation of these new habitats.

While birdfeeders put out by humans may tempt some of the birds, they are not enough for them to stay. The goldfinches have actually found sufficient natural food sources to establish substantial resident populations.

"Our results are suggestive of this species being able to pretty rapidly colonise new environments," says co-author Jordan Boersma, a research associate at the Cornell Lab of Ornithology.

The Cornell Lab of Ornithology has discovered that lesser goldfinches are now less common in their native ranges, indicating that conditions there may be less favourable than the northern climes to which they are flocking. The finding is disturbing but also indicates the resilience and adaptability of migratory species in the face of radical climatic shifts. **Richard Pallardy**

LESSER GOLDFINCH: ROLF NUSSBAUMER/ALAMY



The smallest of the goldfinches, the lesser goldfinch is native to the Americas

The mountain bongo is the world's largest and most endangered forest antelope

Bongos have come home

The secretive antelope is hoping for better times in Kenya

THE MOUNTAIN BONGO – A LARGE, FOREST-dwelling antelope with a chestnut coat and white stripes – is classed as Critically Endangered, with fewer than 100 surviving in scattered populations in Kenya. But there is new hope. Earlier this year, 17 individuals were translocated from a breeding facility in Florida to a dedicated 8ha fenced enclosure on the slopes of Mount Kenya, which will serve as a secure home and breeding ground. The aim is to re-establish a sustainable population across the Mount Kenya ecosystem and beyond.

The mountain bongo is a subspecies of its more numerous lowland cousin. “As a child in the 1970s, I’d see them but they were rare,” says former Kenyan environment cabinet secretary Judi Wakhungu. Hunting with dogs and loss of habitat have since reduced it to the verge of extinction. Wakhungu helped to facilitate the translocation, which involved multiple partners, including the Rare Species Conservatory Foundation in Florida, the Lewa Wildlife Conservancy, and the Meru Bongo and Rhino Conservation Trust.

The herd comprised 12 females, five of which were already pregnant, and five males. They will remain in the enclosure but it’s hoped that in time, offspring will be released into a larger area around Mount Kenya, where some wild individuals remain. Poaching of bongos has been mainly eradicated but human-wildlife conflict is still an issue. In time, it’s hoped wild mountain bongos will appear on the slopes of Mount Kenya, in the Aberdare Mountains to the west and in other upland areas of Kenya.

“Bringing the mountain bongos back to Kenya is a great moment in the restoration of the country’s natural heritage,” says Mike Watson, CEO of Lewa Wildlife Conservancy, “and a reminder of what can be achieved when organisations work together.” **James Fair**

Two emperor penguins with their chick

Secrets of the Penguins

New series for National Geographic offers unprecedented insight

TRANSPORTING US FROM THE ICY shores of South Georgia in the South Atlantic Ocean to the tropical Galápagos Islands, *Secrets of the Penguins* captures the charisma and courage of these flightless birds as they fight for survival in some of the most extreme environments on Earth.

This epic, three-part series was filmed over two years, including a 274-day stint on the Ekström Ice Shelf in Antarctica, home to a colony of 20,000 emperor penguins. It promises an array of filming firsts, such as ‘rockaroni’ chicks (a rare hybrid of macaroni and rockhopper penguins), a hidden cave colony of African penguins, and the astonishing spectacle of hundreds of young emperor penguins leaping from a 15m-high cliff into the icy waters below – and emerging unscathed. Other remarkable sequences include a rockhopper fending off a sealion and Galápagos penguins pinching prey from pelicans.

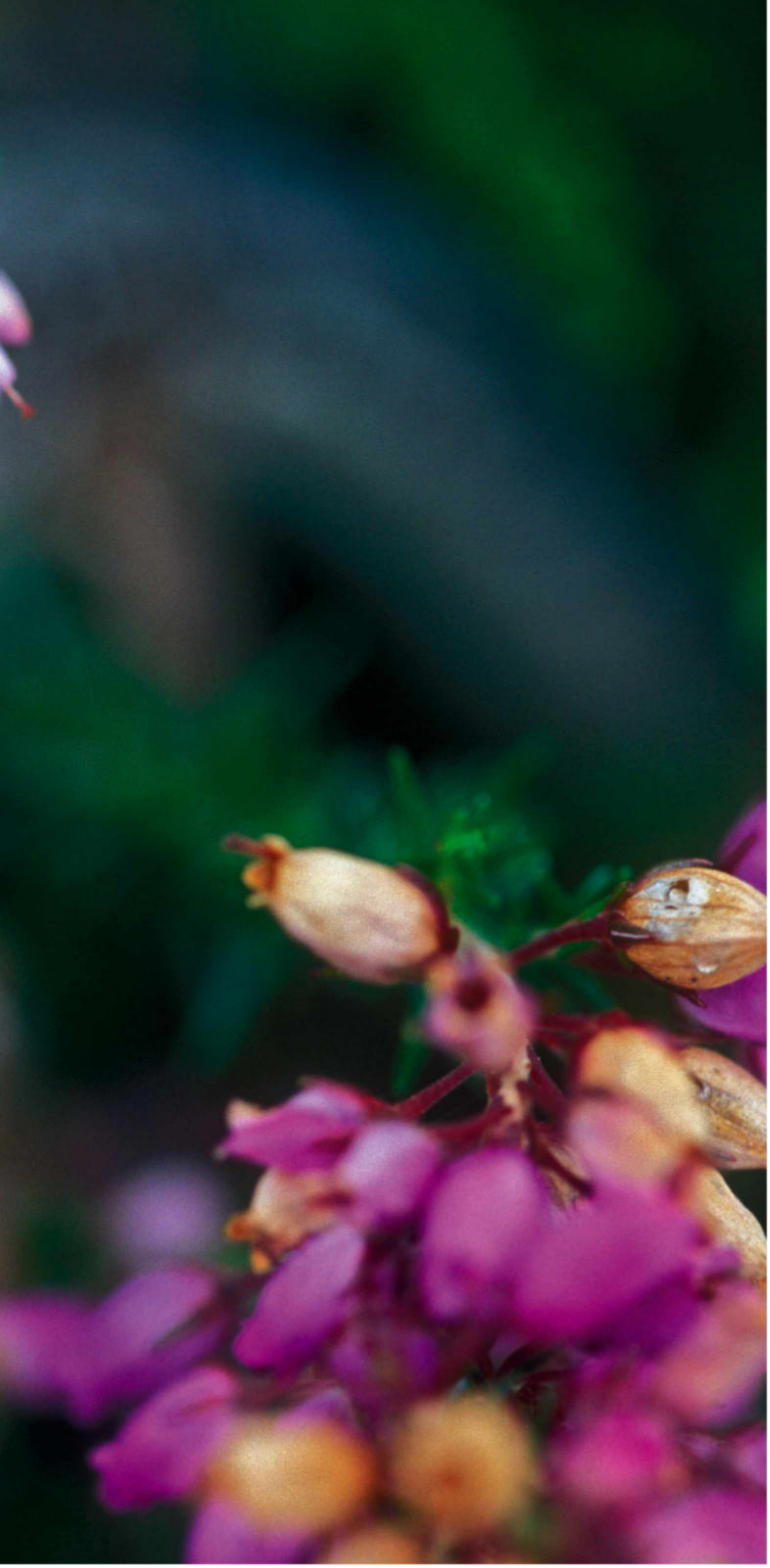
The series is narrated by actor Blake Lively and executive-produced by James Cameron, and is currently available to stream on Disney+. **Sophie Ellis**

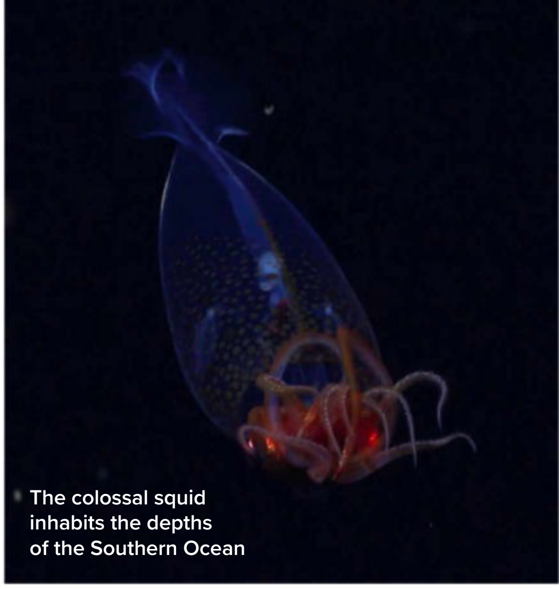
MOUNTAIN BONGO: PETER NDUNG'U FOR LEWA WILDLIFE CONSERVANCY; PENGUINS: BERTIE GREGORY/NATIONAL GEOGRAPHIC

The rare sand lizard can grow up to 20cm in length and live for 20 years

RARE REPTILES GET BOOST IN NEW FOREST

Some 250ha of heathland are being restored in the New Forest National Park to help protect the UK's rarest reptiles, including the smooth snake, sand lizard and adder. So far, overgrown gorse has been cleared to establish open spaces for the animals to forage, breed and bask. The aim is to reconnect habitats and boost populations.





The colossal squid inhabits the depths of the Southern Ocean

Colossal squid spotted

Specimen recorded 600m deep in the South Atlantic

Deep-sea scientists have filmed a live colossal squid in its natural environment for the first time since the species was identified 100 years ago. The individual was a baby. Reaching up to 7m long and tipping the scales at 500kg, colossal squid (*Mesonychoteuthis hamiltoni*) are the heaviest invertebrates on Earth. But this juvenile measured just 30cm.

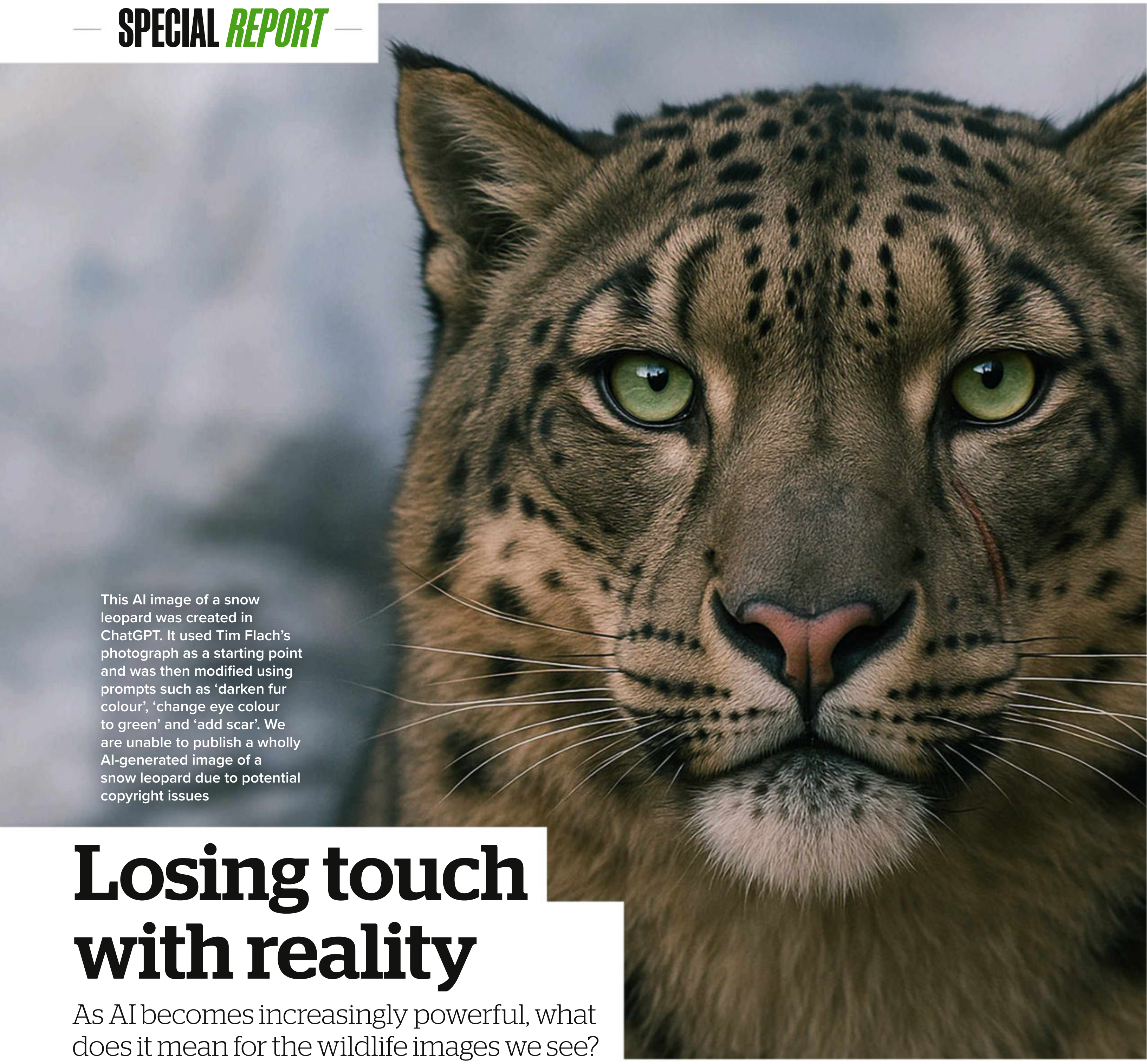
"For 100 years, we have mainly come across them as prey remains in whale and seabird stomachs and as predators of harvested toothfish," says Kat Bolstad of the Auckland University of Technology, an independent expert who verified the footage.

Tales of incomprehensibly huge squid have long been a thing of legend, and these gigantic animals may have inspired stories of mythical sea monsters such as the kraken in Scandinavia and the Scylla in Greece. In his *History of Animals*, Aristotle describes a huge squid – the teuthus.

But colossal squid are real. The species was first named and described in 1925, but little has been discovered about these elusive creatures in the century since. They are believed to have the largest eyes on the planet (the size of a football), which help them to spot sperm whales – their only predator – in the darkness of the deep ocean. They can be identified by the incredible rotating hooks that are found on the middle of their eight arms.

This juvenile was filmed by scientists using a remotely operated vehicle during an expedition near the South Sandwich Islands in the South Atlantic Ocean. It was almost entirely see-through, but will lose its transparency as it grows. **Melissa Hobson**

SAND LIZARD: JOHN CANCALOSI/ALAMY; COLOSSAL SQUID: SCHMIDT OCEAN INSTITUTE



This AI image of a snow leopard was created in ChatGPT. It used Tim Flach's photograph as a starting point and was then modified using prompts such as 'darken fur colour', 'change eye colour to green' and 'add scar'. We are unable to publish a wholly AI-generated image of a snow leopard due to potential copyright issues

Losing touch with reality

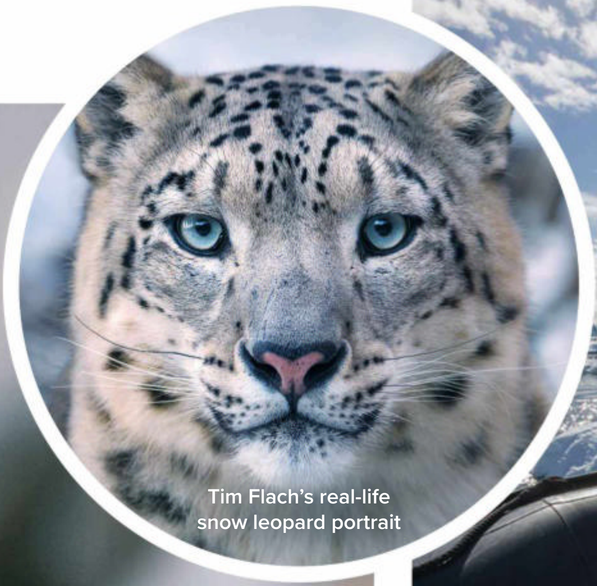
As AI becomes increasingly powerful, what does it mean for the wildlife images we see?

COMPARE TIM FLACH'S WILDLIFE portraits with almost identical images created by artificial intelligence (AI) and you are aware of two things – they are remarkably lifelike but you can still quite easily spot the fake.

The AI colours of a snow leopard, for example, are a little too bright, the definition too sharp. The AI bald eagle stares back at the viewer with cartoonish malevolence – it appears that computers don't do birds, or perhaps feathers, especially well at the moment. In short, AI is good – but not that good. Not yet, anyway.

> "It's only a matter of time before the AI image is indistinguishable from the real thing"

Leaving aside the fact that Flach's photos were 'scraped' from his website without payment to enable the AI program to learn (the question of copyright and AI is currently being debated in parliament), the big issue is: at what point does the machine become so good we can no longer tell one from the other? And what does that mean?



Tim Flach's real-life snow leopard portrait

POLAR EXPE ON

Tim on location taking photos of a leopard seal

"There are ways to ensure what you see in a photograph is what happened"

Flach is in no doubt about the dark shadows looming over his profession. "When the border between what we deem to have existed and not existed starts to dissolve, we have a truly existential problem because we don't know what to trust," he says.

He adds that it's only a matter of time before the AI image is indistinguishable from the real thing. Indeed, outside of wildlife photography, they already are. In 2023, a German artist called Boris Eldagsen topped a category at the Sony World Photography Awards with an image of two women he'd created entirely on a computer.

Eldagsen turned the prize down after admitting to the trick he'd pulled, but his ability to produce something that could fool photography experts suggests that Flach's border between reality and make-believe has already melted away. This is clearly problematic for all forms of news-based photography, including wildlife photography.

We trust wildlife photography – and film-making, of which more later – to be a faithful, accurate portrayal of something that actually happened. As the photographer and writer Mark Carwardine says, "The whole pleasure is marvelling at the encounter and what they saw, and then admiring them for capturing the image."

There's something oddly pleasing about the hardship photographers and cameramen and women have to endure, as well – it's surely why the 'making of' sections at the end of natural history documentaries are so popular. "The crew spent three weeks in -30˚C while enduring 80kph winds…" How did they tolerate these conditions and still capture stunning footage of emperor penguins, we muse.

But there are ways to ensure beyond any doubt that what you see in a photograph is what really happened. Competitions such as Wildlife Photographer of the Year (WPOY) insist that entrants submit their RAW files as evidence that the images have not been tampered with, other than adjustments for details such as colour and contrast. But that won't have any effect on AI fakes posted on, for example, social media.

Susan Norton, executive director of the International League of Conservation Photographers (iLCP), says she regularly sees AI-created images of animals on sites such as Instagram, and many now are only detectable with a degree of expert knowledge of the species depicted.

WILDLIFE PHOTOGRAPHER SHANE Gross, who won the 2024 WPOY competition with his photo of toad tadpoles swarming in a Canadian lake, says there are other ways to combat the threat of AI. For instance, he points out, the state of New Jersey has passed legislation that makes it a crime to create 'deepfake' images or audio with the intent to deceive other people, with fines of up to $30,000 for anyone found guilty.

With the right safeguards, he doesn't believe that AI will hit the genre of wildlife photography he works in. "AI doesn't threaten the way I make a living but, looking down the road, I could see it cutting into some revenue streams, especially the art print space," he says.

Over many years, wildlife photography has become virtually synonymous with

SNOW LEOPARD PORTRAIT (INSET) AND PHOTOGRAPHING SEAL: TIM FLACH

Tim photographing gentoo penguins in Antarctica

> **“AI might serve to exacerbate people’s sense of disconnection from the natural world”**

promoting conservation, and here lies perhaps the biggest danger. What if people use AI to cough up images of rare species where none exist, or to make them seem more abundant than they really are, or to create footage of an animal that never took place? At what point does AI start to tell lies about the health of the natural world?

Last year, Norton went to the Wildscreen Festival and attended a session called ‘AI won’t take your job, but the person who can use it better than you will’. She describes how there was widespread consternation, bordering on outrage, when a speaker voiced the opinion that to use AI in certain circumstances is acceptable.

“If there had been stones, they would have been thrown,” she says. “It became the main topic of conversation over the next few days.”

The speaker in question was Christopher Paetkau, a natural history film-maker and co-founder of Alwaysbuild Studios. He outlined to the Wildscreen audience a past scenario where he had obtained footage of a mother polar bear and her cub on sea ice and, later, the same pair on the shore. But they had missed capturing the action in between, where they swam back to the land.

“I suggested that instead of filling that gap with generic stock footage of another random bear pair swimming, AI could have helped recreate that scene using visual data from the actual bears we’d filmed,” says Paetkau. “The point wasn’t that I had done this but to illustrate the grey area between authenticity and storytelling that already exists in the industry.”

PAETKAU ALSO SHOWED A FIVE-MINUTE clip of a polar bear hunting Arctic terns among fireweed. He used ChatGPT to produce a script and another AI programme to voice it, and had the entire sequence finished in two days. “That’s what I think made people nervous,” he says. “It wasn’t the idea, it was the speed.”

Certainly, Paetkau is keen to open up the debate about where AI should and shouldn’t be used within film-making. As well as using it to create a sequence (such as polar bears swimming to shore) that would otherwise be done in a way that is equally deceptive, it could also have other benefits, he argues.

“It’s not lost on anyone that film-makers show up with helicopters, camera teams and trucks to document the fragility of the ecosystems they’re actively disrupting to create an impactful story,” he says. “AI could easily take that to its logical conclusion – eliminate the observer to save the observed.”

It’s also worth mentioning that wildlife photographers don’t have a perfect record in this regard either. When the wildlife photographer Thomas Mangelsen was asked if he had ever seen photographers disturb wildlife, he responded, “Oh, a couple million times, I suppose.”

But the issues stirred up by the ever-growing sophistication and power of AI are surely greater than whether it can reduce harm to wildlife from film-makers and photographers. Tim Flach says that though there are ways of establishing to an audience whether a photo is ‘real’ or not (“There will be labelling,” he says) and insists he’s not some luddite opposed to any emerging technology, AI could have more general, negative impacts besides the ones already explored.

“We have massive problems with people understanding the natural world, and AI might only exacerbate that sense of disconnection,” he warns. And that surely is the biggest danger – that this technology only serves to drive us further away from the wildlife we love.

ABOUT THE AUTHOR

James Fair is a wildlife journalist with a specialism in conservation and controversial issues. Read more at jamesfairwildlife.co.uk.

PHOTOGRAPHING PENGUINS: TIM FLACH

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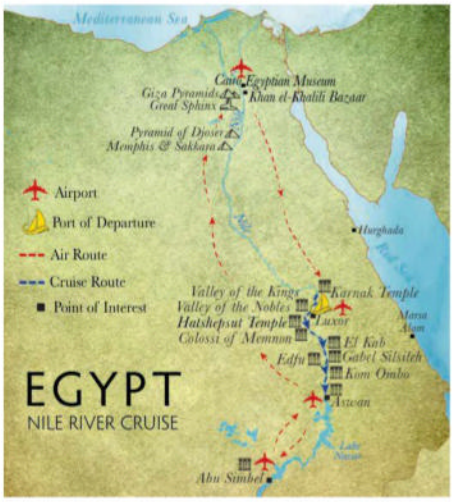
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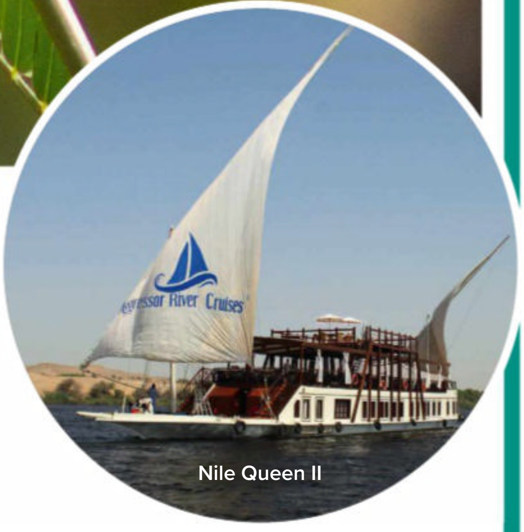
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wild JUNE

7 nature encounters for the month ahead

WITH NATURALIST AND AUTHOR BEN HOARE

1

Elder umbels bear hundreds of tiny flowers in late spring, followed by small purple-black fruit in late summer

Spring's scent

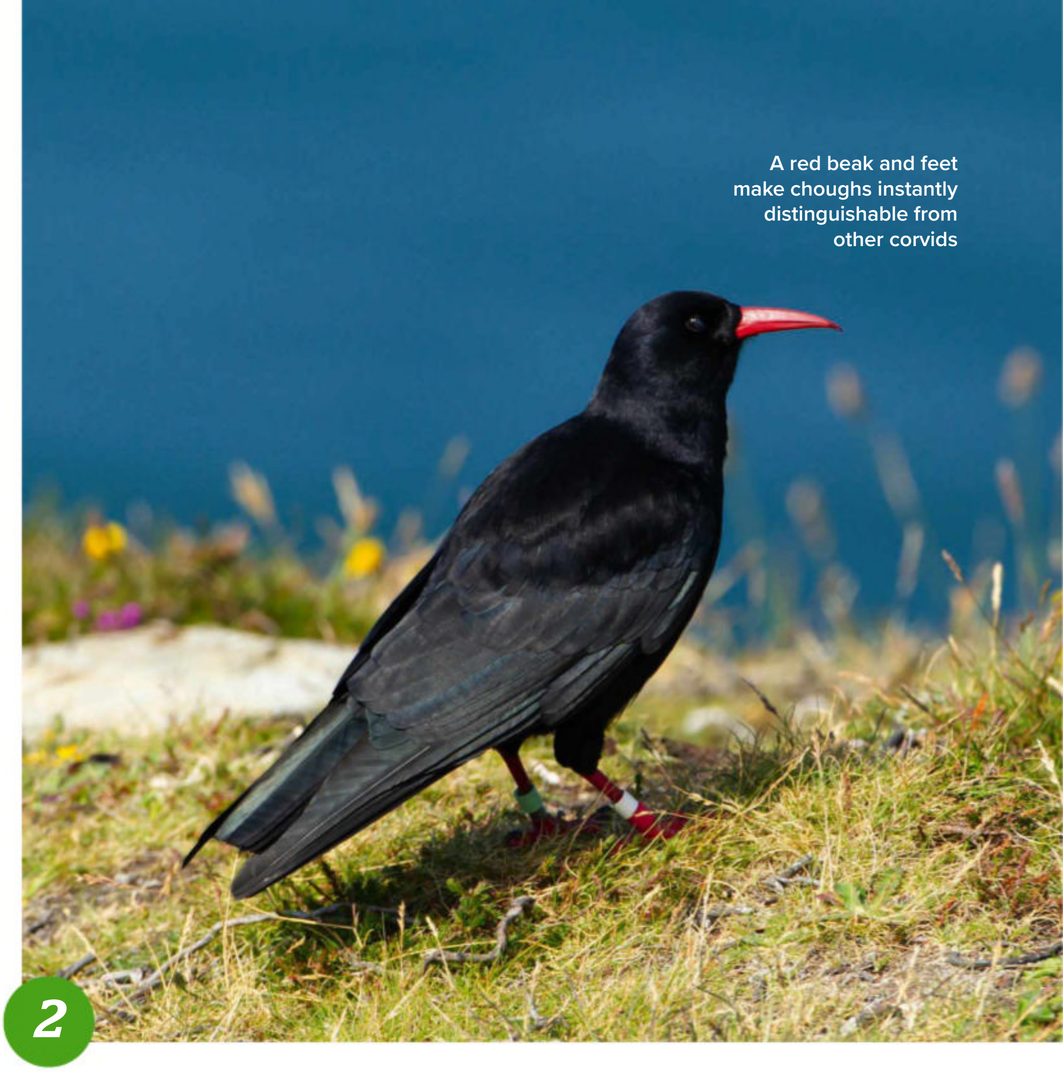
FRAGRANT AND FROTHY, ELDER blossom is a highlight of May and June. The flat-topped flowerheads turn together to track the sun each day and attract a host of invertebrates, especially hoverflies and tiny, bug-like insects called thrips. But while elder is abundant in hedgerows, scrubby woods and waste ground, and is easily grown as a crop, most elderflower used as flavouring in the UK drink industry is still imported.

Charismatic corvids

CHOUGHS ARE MOUNTAIN BIRDS IN mainland Europe but in the British Isles have always been associated with wild, rocky shores, where they nest on sea cliffs. In June, you can see families of adults and recently fledged young flying along the coast, their musical 'key–aww' cries quite unlike the harsher calls of crows, rooks and ravens. They are acrobatic, tumbling in the air.

To thrive, choughs need lots of well-grazed, pesticide-free grassland near their breeding cliffs for forage – they love to probe cowpats with their red beaks to extract juicy fly and beetle grubs.

Sadly, chough populations in Scotland and parts of Wales continue to decline, and there are none in Northern Ireland. But choughs are doing brilliantly in Cornwall, having naturally recolonised the county in 2001 after a 50-year absence: in 2024, 40 pairs raised a record 108 young. On Kent's white chalk cliffs, where the species was reintroduced in 2023, choughs bred for the first time in two centuries.



A red beak and feet make choughs instantly distinguishable from other corvids

2

3

Slowly does it

BELOW THE SURFACE OF FAST-flowing rivers, freshwater pearl mussels are reproducing. June is when these bivalve molluscs breed, and their fascinating life-cycle begins with the males releasing sperm into the current. It's caught by the females, in whose shells the tiny larvae develop, until being fired out again in late summer in their millions. Only a handful reach the next stage of the life-cycle – inside the gills of young salmon or trout.

The parasitic mussel larvae then spend nine months stuck to their host's gills, living off particles of food, before letting go in spring and burrowing into the riverbed gravel. After five years or more, the mussel shells poke above the gravel – but won't mature until at least 15 years old. Some live for more than a century.

Freshwater pearl mussels are endangered in Britain due to river pollution but pioneering conservation work gives room for hope. In Cumbria, the mussels are being raised in captivity, then reintroduced to restored riverbeds.

Female freshwater pearl mussels can each produce up to four million larvae

ELDERFLOWER: UNPICT/ALAMY; CHOUGH: JAKE STEPHEN/GETTY; MUSSELS: LINDA PITKIN/2020VISION/NATUREPL.COM

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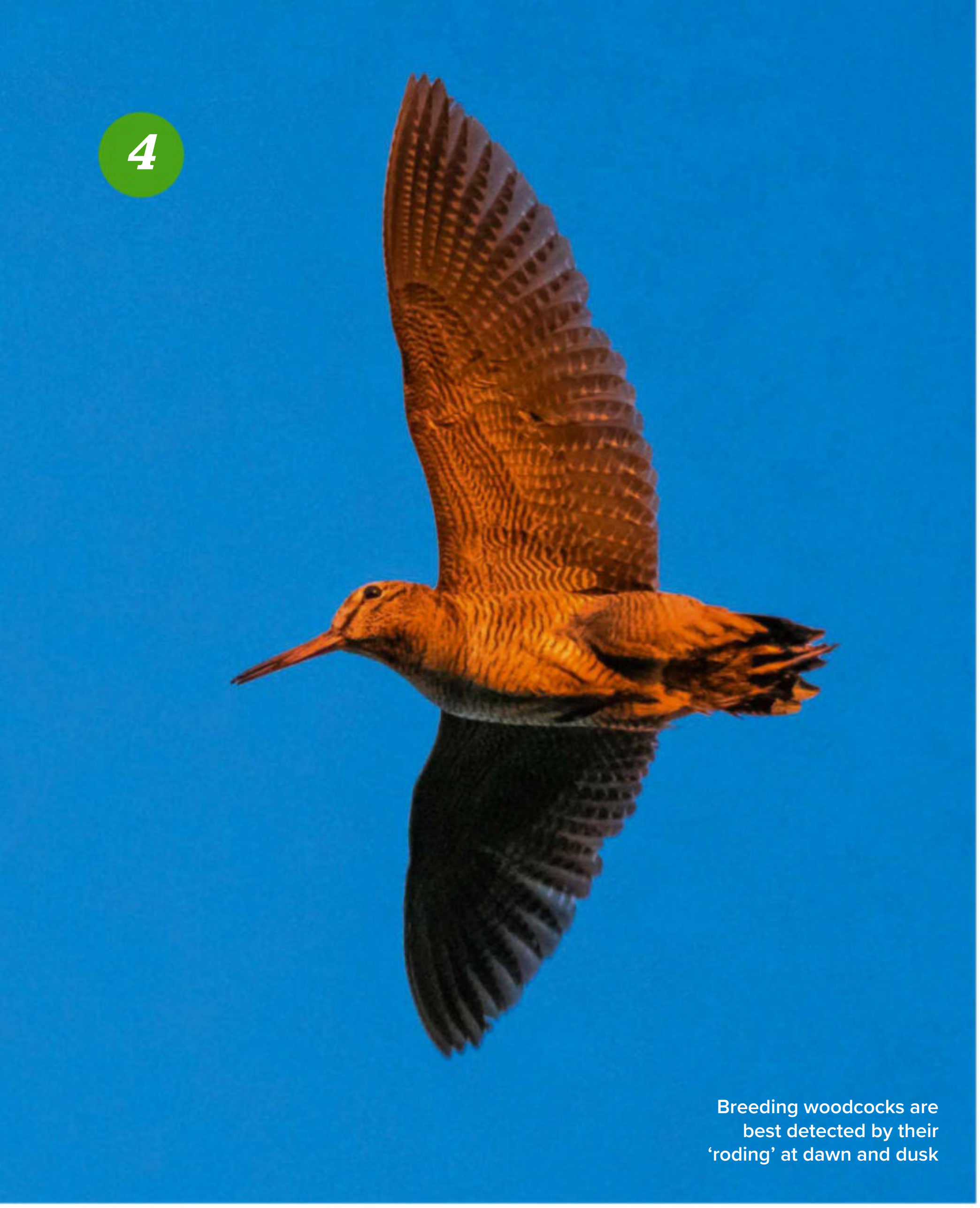
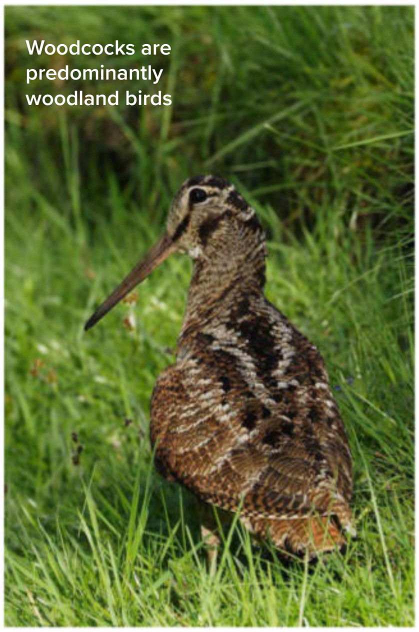


Breeding woodcocks are best detected by their 'roding' at dawn and dusk

Aerial displays

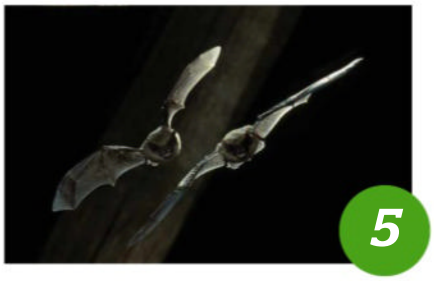
The evocative display flights of woodcocks, known as roding, are a unique dawn and dusk spectacle best experienced on still evenings between April and July. They take place as the light fades, when the male woodcocks fly back and forth over their woodland and heathland breeding grounds, just above treetop height, while uttering a strange grunt-squeak. The birds fly in straight lines, reappearing every couple of minutes to complete another lap of their invisible circuit. Roding is actually a form of competitive display, or lekking, in which several rival males fly circuits to compete for the attention of females below.



Woodcocks are predominantly woodland birds

ABOUT THE AUTHOR

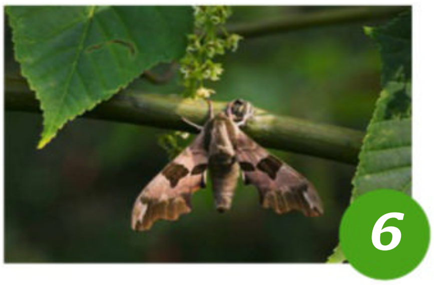
Ben Hoare is a wildlife writer, editor and all-round nature nerd. He also writes highly acclaimed illustrated natural history books for children.



5

Pup and away

Female common pipistrelles give birth in June, usually in roof spaces. Like most bats, they have a single pup, which suckles for a month or so and is independent two weeks later. Domestic cats are one of the main dangers facing the inexperienced fliers as they fly in and out of the roost.



6

City slickers

Lime hawkmoths take flight from May to June and have stunning looking pink, cream and green wings, which they hold swept back, like fighter jets. Since their caterpillars happily feed on London plane trees, not just lime, the species occurs in urban as well as rural areas.

7

Sizeable slugs

Reaching a whopping 20cm long, ash-black slugs are the largest land slugs on Earth. Found across northern Europe, including in Britain's ancient woods, they graze lichen and algae. Early summer sees these hermaphrodites couple by moonlight, each partner fertilising the other.

WOODCOCK: SIMON STIRRUP/ALAMY; BATS AND HAWKMOTH: STEPHEN DALTON/NATUREPL.COM; SLUG: FABRICE CAHEZ/NATUREPL.COM

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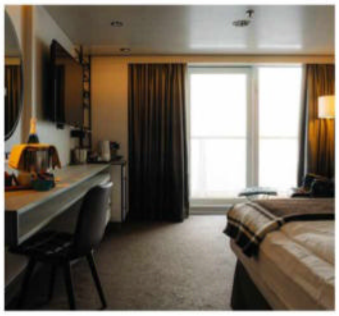

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Gillian considers the importance of nature connection

NINA CONSTABLE

OPINION

GILLIAN BURKE

“Britain could become an island laboratory for nature’s recovery”

“THE JOURNEY STARTS SMALL,” was how I began my very first column for *BBC Wildlife* in November 2021. Today, as I begin my last column, the blinking cursor on the empty page is daring me to a big finish but my mind draws a blank.

As a science and natural history communicator, my most public-facing role has been to celebrate Britain’s wildlife. I was often asked what I thought was the best thing about British nature and I would quip that I could go for a walk and not worry about getting eaten (I love predators but not when I’m on the menu).

As much as this makes for lovely Sunday walks, the absence of any natural apex predators – coupled with industrial farming, road expansion, increasing urban sprawl, forever chemicals, river pollution and so on – means Britain is one of the most nature-depleted countries in the world, and last among the G7 nations.

A bleak summation but with beacons of hope. I have had the privilege of travelling the length and breadth of the country to cover stories of natural recovery. These have ranged from the tiny St Piran’s hermit crab finding its way back after one of the worst oil spills in the UK, to the transformation of former coal-mining sites from post-apocalyptic scenes to thriving wetland habitats, as was the case at RSPB Fairburn Ings. With more stories such as these (plus a generous dollop of political will), bog-standard post-industrial Britain could claw its way back from the bottom of the league table to become the greatest island laboratory for nature’s recovery.

On the other hand, indigenous peoples steward at least 37 per cent of remaining natural lands, with the lowest levels of ecological disturbance worldwide, including one-third of the world’s intact forests. Yet they make up only 6.2 per cent of the global population. The numbers alone tell me that we have more to learn from our indigenous brothers and sisters about protecting the Earth than they do from us. Perhaps it’s time to ask for their help.

I take myself outdoors, knowing this to be a cure, for me at least, for writer’s block. A pool of late spring sunshine draws me into an otherwise unremarkable corner of the garden, where some paving stones butt against the shed. I notice a single branch of ivy making its way along virgin territory, the tiny new leaves unfurling tentatively like pioneers into the unknown.

A winter’s worth of wind has gathered a stack of leaf skeletons, the lignified fibre remains of last autumn’s drop, to create some welcome cover for a few worker black garden ants that are calmly scouting the area. A common sun-jumper spider, its bright yellow legs adding a pop of colour to the shadows, stalks them in patient pursuit.

As I watch all these creatures getting on with the business of staying alive, my ego does a slow fade and, for a blissful moment, I simply exist alongside the ivy, the ants, the spider, the moss, the lichen… in fact, with all life. And there it is, my big theme, nature connection – but nature connection that is more than a hobby, a research project or part of a bucket list, rather a way of being in a state of true parity with all life.

Understanding that we *are* nature, and that we have everything to gain from nature’s recovery, is the critical piece of the puzzle if we are to change the current climate and ecological trajectories.

It has been a pleasure and an honour writing this column. Thank you to the editorial team, who have been brilliant, and of course thank you for reading.

Gillian Burke is a biologist, writer, film-maker, presenter and podcaster. She was part of the BBC Two *Watches* team from 2017-25.

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FEMALE OF THE SPECIES

MOLE SALAMANDER

A self-replicating sisterhood of salamander gene thieves

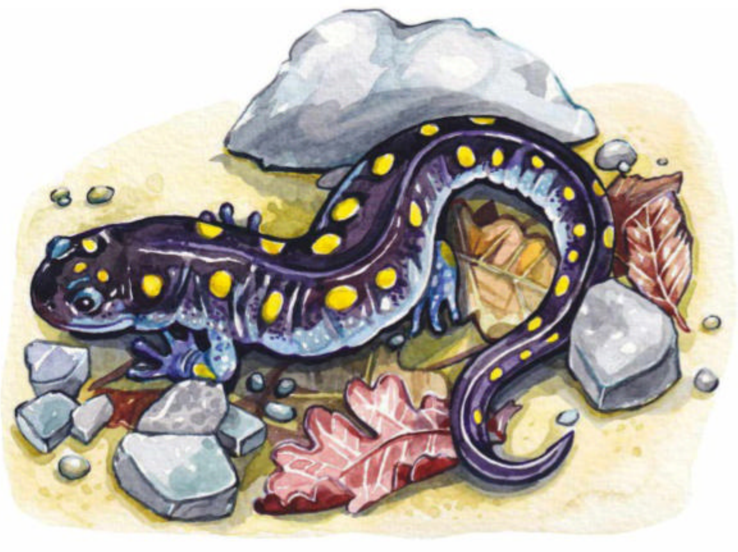
There's a peculiar posse of amphibians creeping through the damp leaf litter of the North American Great Lakes. They're about the size of a slim sausage, splotchy brown with watery smiles and bulging eyes. Cute, maybe – but, biologically, they are rewriting the rules of sex.

Meet the unisexual mole salamanders, an all-female lineage that's been thriving for millions of years by not just cloning but occasionally stealing DNA from other mole salamander species. They are the only known vertebrate to reproduce via a process called kleptogenesis.

If that sounds like the reproductive equivalent of a Netflix heist drama, you're not far off. These self-replicating sisters are members of a group that also includes five sexually reproducing mole salamander species. The unisexual sisterhood evolved from a hybridisation event, more than five million years ago, between these sexually reproducing species. Now the unisexuals parasitise their sexually reproducing cousins' sperm for their own purposes.

During mating season, sexually reproducing mole salamander males leave sticky packets of sperm around the wetlands. A unisexual female will pick one up – but here's where things get weird. She doesn't use his sperm to fertilise her eggs. Instead, she needs it to stimulate her egg production. Mostly she then discards the sperm and produces clonal eggs. But on occasion she'll absorb the sperm's genome into her egg, which either adds to her existing genetic material, or replaces a previously stolen chunk of DNA. It's reproduction à la carte.

Some individuals have up to five different genomes floating around in their cells, making them walking mash-ups of multiple species. Researchers can't give these unisexual salamanders a traditional species name, because they don't play by the rules of a typical species. So, they are just known as *Ambystoma spp*.



This go-it-alone female salamander has little time for the male of the species, except for its special sperm pack delivery at mating time

ILLUSTRATION BY HOLLY EXLEY

And while this reproductive system is a dream for the unisexuals, it's a bit of a nightmare for evolutionary biologists. Their genomes are so tangled it took decades to understand how they reproduce. It wasn't until molecular techniques improved in the 2000s that researchers confirmed kleptogenesis as the salamanders' MO.

Asexual lineages typically face an evolutionary dead end due to the lack of genetic diversity – they can't adapt to new diseases or environmental change. But these salamanders sidestep the problem by exploiting the genomes of their sexual cousins, which they can remix with their own during the creation of eggs. They can also reproduce at twice the rate of their sexual cousins. So you might expect them to outcompete their sexual cousins in the wild. But researchers have discovered the unisexuals' Achilles heel: they're not as fit.

The salamanders' vigour was tested by placing them on a tiny treadmill. Every three minutes, researchers removed them, flipped them on their backs and timed how long it took them to get back on their feet to test their tiredness.

The study showed that the sexually reproducing species could go about four times the distance as the all-female team. This gives them an advantage when dispersing. They can travel further in search of fresh water sources if their home pools have dried up – a clear advantage in this time of climate change. So, sex does have its benefits.

These all-female salamanders are evolutionary marvels. They have blurred the boundary between sexual and asexual reproduction and forced us to rethink what's 'normal' in biology.

Lucy Cooke is a broadcaster, zoologist and author of *Bitch: What Does It Mean To Be Female?* The Penguin paperback is on sale now.

BBC SOUNDS

Catch up with Lucy's three-part BBC Radio Four series, *Political Animals*

More than than 60,000 people joined the Restore Nature Now march in June 2024. Do some politicians view them as 'eco-nutters'?

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PROTEST MARCH: KRISTIAN BUUS/GETTY

OPINION

"The level of complacency about conservation is rapidly evolving into outright hostility"

MARK CARWARDINE

CONSERVATIVE PARTY LEADER Kemi Badenoch called environmentalists trying to stop the approval of new North Sea oil and gas fields 'eco-nutters' during Prime Minister's Questions. Nigel Farage, leader of Reform UK, called Prince Charles (as he was then) a 'stupid eco-loony'. Meanwhile, 'eco-zealots', 'eco-morons' and 'eco-clowns' are all expressions used by national newspapers on a regular basis.

Why are environmentalists treated with such little respect? There is no longer just a shocking level of complacency about conservation. It is rapidly evolving into outright hostility. If politicians and the media were to talk about 'LGBTQ+ nutters' or 'farming-morons' or 'junior doctor-loonies' with the same level of disdain they wouldn't get away with it. They would be forced to resign, and rightly so. But environmentalists are fair game.

> "I believe we environmentalists have been tilting steadily towards political crisis for some time"

I believe we environmentalists have been tilting steadily towards political crisis for some time – and the name-calling is just one manifestation. The crisis is not one of legitimacy (the evidence for ecological destruction grows by the day) and it isn't one of collapsing public support. I think it's all about perception.

The first issue is money. Politicians see green issues as a threat to short-term economic growth. Indeed, chancellor Rachel Reeves recently claimed that we have gone too far "in protecting every bat and every newt". But the assertion that protecting nature undermines economic growth is simply incorrect: a few months ago, the Office for National Statistics issued a report that valued UK ecosystems at £1.8 trillion.

Yet there was an uproar when the chairman of HS2 revealed that a 'bat tunnel', built in ancient woodland in Buckinghamshire, cost £100 million. According to some media reports, this amounts to more than £300,000 per bat in the 300-strong colony of rare Bechstein's bats. It's not true, of course. The cost of the 1km-long tunnel is eye-wateringly high because of an HS2 decision to make it wider to accommodate local train services – nothing to do with bats. And it's nonsense to suggest that the tunnel will protect 'just 300' of them. It will be there for decades, protecting generation after generation of bats, as well as many other mammals, birds and insects. But the outcry was about the principle – apparently, wildlife isn't worth that much money.

It's exasperating. There were no howls of protest when someone bought Italian artist Maurizio Cattelan's unusual artwork of a banana duct-taped to a wall for $6.2 million (£4.7 million) in November, or when René Magritte's *The Empire of Light* sold for a mind-boggling $121.2 million (£91 million) on the same day.

Another predicament is that environmentalists can come across as negative (we condemn everything from flying to eating meat), depressing (we warn that the future is not going to be bright for a soon-to-be 10 billion people) and misanthropic (we are often misjudged as people-haters). The fact that tackling environmental issues is the only thing that stands between us and some pretty nasty stuff doesn't seem to matter.

Some of the tactics used by more militant factions of the environmental movement probably don't help. The headlines are all about them and their antics – their intended messages often end up lost. They should target the people and companies responsible for the problem, not innocent bystanders. No wonder the general public has taken umbrage.

AT A GLANCE

- Respect for environmentalists seems to be at an all-time low, with some politicians and media frequently referring to anyone trying to avert the climate crisis or tackle biodiversity loss as an 'eco-loony' and worse.
- Yet surveys consistently show widespread public support for the goals of the environmental movement.
- For example, a 2024 United Nations Development Programme survey found that 80 per cent of people worldwide want their governments to take stronger action to tackle the climate crisis.

And, finally, we can sometimes come across as a bit eccentric. I've always questioned the temptation to dress up as a rabbit or a badger when joining a protest march for wildlife. It may be fun but it's not a good look: you can just imagine the politicians watching and thinking 'bunny-hugging loonies – not to be taken seriously'. Though, I admit, it's a thin line between showing your passion and appearing professional. I didn't become an environmentalist because I care about economic growth. I care about wildlife. I love bats and newts. And what's wrong with that? Other people love surrealist paintings.

I get that there are worse things than being called an 'eco-loony'. And we know that promoting efforts to curb climate change and biodiversity loss does not make us nutters. But perhaps we should reconsider how we present ourselves and what we are trying to achieve?

Want to comment?

Share your thoughts on Mark's column by sending an email to wildlifeletters@ourmedia.co.uk

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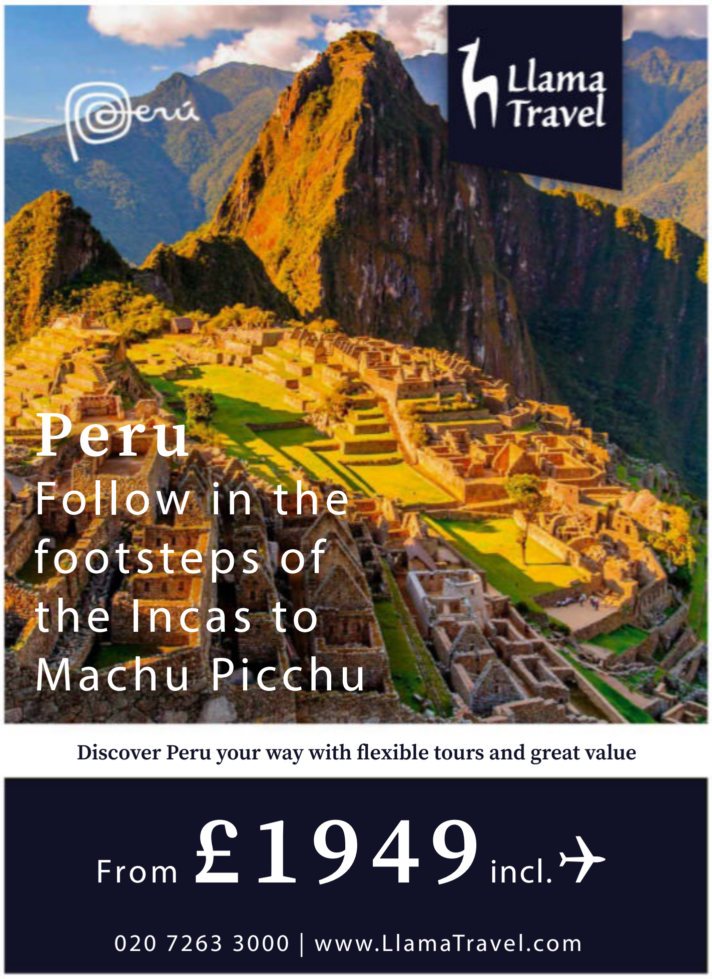

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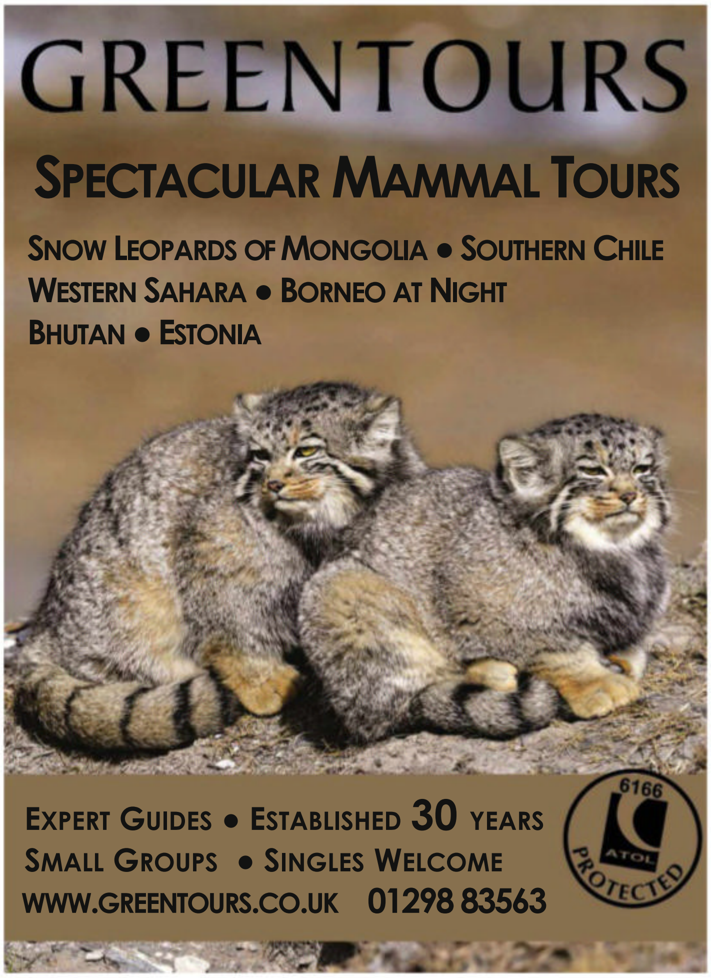

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WILD IN THE CITY

— WITH DAVID LINDO —

The puma is the 'small cat' with a big presence, as Los Angeles resident P-22 went to prove

The puma P-22 lived for more than a decade in Griffith Park in Los Angeles and became a bona fide (if rarely seen) Hollywood celebrity

THERE'S A SECRET I have to share with you. I think I was a puma in a previous life, living in the Rockies in western North America. You might laugh but I am deadly serious. I was athletic and lived a solitary existence. And, in keeping with true puma lifestyle, I was prone to leaping from rock to rock, springing across wide, deep precipices or bounding up trees – just because I could.

Since I was a child, I have always identified with this slinky cat, though I have yet to actually see one. A few years ago, I was in the west Hollywood Hills in Los Angeles on an afternoon walk through a well-vegetated canyon. On seeing an unknown sparrow dart into some brush I decided to go in after it, eventually getting myself deep into the tangle and quite a distance from the trail.

Suddenly, I heard a loud crashing in the nearby thick bushes and was aware of being in the presence of a large, unseen animal. This was no deer; it had to be a puma. Despite my excitement I clicked into self-preservation mode. I had to retreat. I certainly did not want to be a news item in the *LA Times*: "British tourist mauled by puma in Franklyn Canyon."

Had I been in nearby Griffith Park I could have claimed a brush with P-22, the 'celebrity puma' that was the most famous of its kind in Los Angeles, perhaps even in the world. Though it is one of the largest municipal parks with wilder areas in the USA, at 1,740ha Griffith Park is minuscule in a puma's world. These cats need upwards of 390km^2 to roam around in.

P-22 had somehow managed to cross two potentially deadly freeways to settle in Griffith Park. The puma was first spotted in 2012 when his image was taken by a camera trap, and his fame erupted once he was featured within the pages of *National Geographic*. But he was trapped in an urban green oasis with no chance of meeting a mate. Despite lingering for 10 years his survival echoed the problems that these cats and other wildlife face in urban areas.

The puma is not a proper big cat in the *Panthera* genus like the African lion or jaguar. The main thing separating those big guys from the smaller cats is their ability to roar, due to the rigid hyoid bone situated at the front of their throats. Thus the puma could be best described as a large small cat equipped with the ability to purr – something that the small cats have over the big cats.

Los Angeles is one of only two megacities in the world (the other is Mumbai) where large cats occur within the bustling city limits, and the animals have adapted to become increasingly nocturnal in order to avoid people. Encounters are rare and there have been no fatalities to date. But there are threats to their existence. The urban habitat is fragmented due to development and road building, which is the main reason that the animals meet untimely ends, under the wheels of vehicles.

Additionally, there is a limited gene pool due to the cats being locked in by busy freeways and not able to disperse widely. Finally, the widespread use of anticoagulant rodenticides has taken its toll, with the animals ingesting them via their prey. This is the fate that befell the beloved P-22. When captured, he had to be put down due to rat poisoning. LA had lost a feline legend. So I have to regard my potential close encounter as a very precious moment.

David Lindo, AKA the Urban Birder, is a naturalist, broadcaster and author of many books, including *Fly: A Child's Guide to Birds* (Magic Cat Publishing)

DAVID LINDO: ASHLEY BOONE; P-22: STEVE WINTER

Mike Dilger's

WILDLIFE SPECTACLES

The broadcaster, naturalist and tour guide shares the most breathtaking seasonal events in the world

YOU GOTTA MOVE

SOARING ALBATROSS

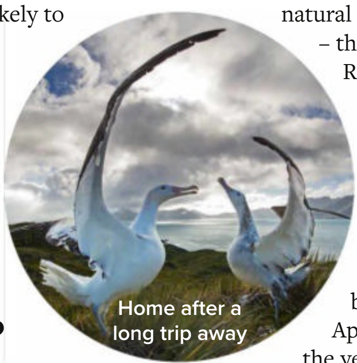
The broad wingspan of this roamer carries it across the oceans in search of food

LONG BELIEVED TO BE A SYMBOL OF GOOD fortune, the albatross has its own annual world awareness day on 19th June. As legend would have it, the bird embodies the souls of sailors lost at sea, and to harm one was considered disastrous and likely to invoke the sea's wrath.

Nowhere is this better conveyed than in Samuel Taylor Coleridge's poem *The Rime of the Ancient Mariner*. It chronicles the story of a mariner who shoots an albatross and is forced to wear the dead bird around his neck – as penance and to ward off any future misfortune at sea. A deceased albatross 'necklace' still serves as a metaphor for a weighty burden.

The best known representative of this group of 22 species is also the bird with the natural world's longest wingspan – the wandering albatross. Reaching up to 3.5m from wingtip to wingtip, the adults have white bodies, black and white wings, and large pink bills and feet. They breed on a series of remote sub-Antarctic islands between November and April, then spend the rest of the year on long foraging trips across the Southern Ocean, truly living up to their 'wandering' moniker.

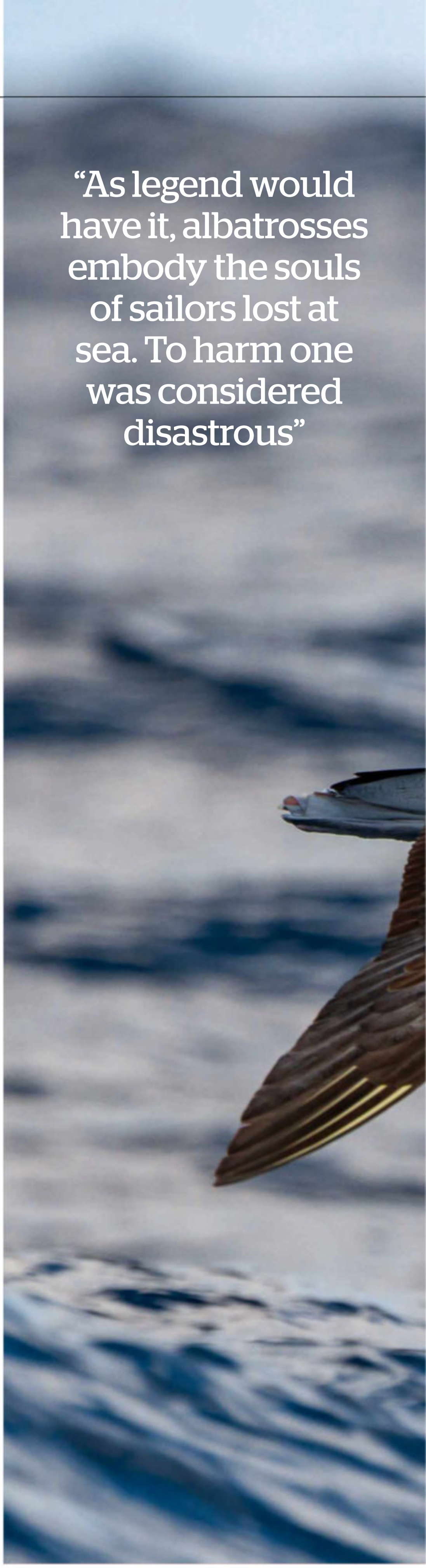
Spending most of its life both out at sea and in the air, this species is capable of travelling huge distances, with satellite



Home after a long trip away

Did you know?

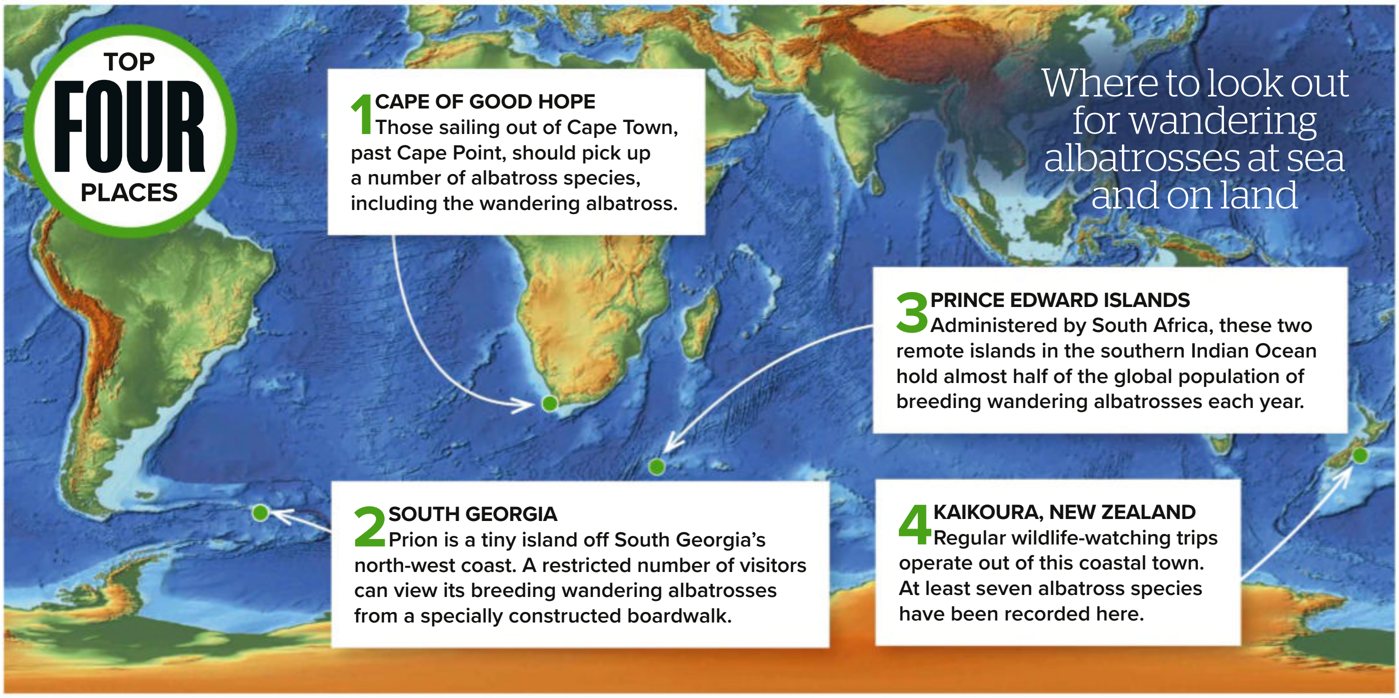
Albatrosses like to dance. Actually part of their breeding ritual, the posturing and prancing includes sky-pointing, sky-calling, preening and rattling. A potential partner can go on for hours trying to entice a mate.



> "As legend would have it, albatrosses embody the souls of sailors lost at sea. To harm one was considered disastrous"

ALBATROSS IN FLIGHT: JORDI CHIAS/NATUREPL.COM; BREEDING: CHRIS & MONIQUE FALLOWS/NATUREPL.COM

Albatrosses forage over the colder oceans as upwellings bring food closer to the surface



TOP FOUR PLACES

Where to look out for wandering albatrosses at sea and on land

1 CAPE OF GOOD HOPE
Those sailing out of Cape Town, past Cape Point, should pick up a number of albatross species, including the wandering albatross.

2 SOUTH GEORGIA
Prion is a tiny island off South Georgia's north-west coast. A restricted number of visitors can view its breeding wandering albatrosses from a specially constructed boardwalk.

3 PRINCE EDWARD ISLANDS
Administered by South Africa, these two remote islands in the southern Indian Ocean hold almost half of the global population of breeding wandering albatrosses each year.

4 KAIKOURA, NEW ZEALAND
Regular wildlife-watching trips operate out of this coastal town. At least seven albatross species have been recorded here.

telemetry revealing journeys of 900km in a single day. During the breeding season, just one foraging flight can cover up to 16,000km, its farthest point approaching 1,800km from their breeding sites.

The birds weigh close to 10kg, so taking off from land and water can be difficult and energetically expensive. But once they are airborne, 'the hard yards' are done, as they can then traverse huge expanses with a minimum of effort. This 'dynamic soaring' allows the birds to fly effortlessly and efficiently over the ocean with barely a wing flap, and has fascinated scientists for over a century.

> "Dynamic soaring allows the birds to fly effortlessly and efficiently over the ocean"

Once airborne, albatrosses appear to ride a sidewinding rollercoaster, rarely going more than 15m above the ocean surface. Frequently flying across the prevailing winds, they are able to exploit differences in the rapidly changing wind velocity and direction (or wind shear) at varying heights above the water to sustain soaring flight. Here, their S-shaped manoeuvres consist of alternating upwind and downwind turns. Each cycle is started both close to the ocean and in a wave trough, where wind velocity tends to be minimal. The albatrosses then climb diagonally upwind, and across the wind shear, to a height of around 10m. This is then followed by a turn of anywhere between 60 and 90 degrees, depending on the precise conditions, as they descend diagonally across the wind shear to repeat the process.

The wandering bird is known to follow ships to try and pick up discarded food or bait

As the albatrosses cross between these slow and fast layers, airspeed is gained, which is crucially more than the slowing effect created by drag when the turns are executed. Additional gains are also made from exploiting the updraughts created by the movement of the ocean. This 'wing-up' is especially useful on light wind days.

The albatrosses' long-distance travel is essential as food sources are patchily distributed across vast expanses of ocean. And with a diet consisting of squid, fish and krill, an extraordinary sense of smell helps lead them towards areas where food is in the highest concentration.

Sadly, the wanderer's global population has halved in a few generations, and currently stands at around 20,000. Longline fishing and plastic pollution are the main concerns out at sea, with entanglement or the ingestion of rubbish leading to injury and even death. Both issues are avoidable with thought and planning. Should we ever lose this iconic species, there wouldn't be anything to dangle from our necks while hanging our heads in shame.

LOOK CLOSER

Old wings

Wandering albatrosses can live for up to 60 years, and pairs often mate for life. Established pairs only produce a single chick every two or three years. After the youngster leaves the nest, it will not return for between five and seven years, after which it too will be ready to start breeding.

Desalination

All albatrosses possess a salt gland located above their nasal passages, which helps to excrete excess salt from their bodies. A high saline solution is produced, prior to being expelled from their nostrils, with the liquid sometimes causing a pinkish-yellow stain on the feathers of the birds' necks.

Natural inspiration

Computer models created to simulate dynamic soaring are helping with the design of the next generation of wind-propelled drones and gliders. If programmed to fly along similar energy-efficient trajectories as the albatrosses, this could mean that long-range monitoring missions could be carried out in the oceans' remotest locations.

NEXT MONTH

The incredible spectacle of South Africa's sardine run

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The popular naturalist, author and TV presenter reveals a secret realm of overlooked wildlife

PRIMAL SCREAM

HORNED SCREAMER

A wildly unusual bird call shatters the peace of a tropical dawn

I awoke to an unearthly din, like a rubber foot pump with hiccups. It was so loud that I could *feel* it resonating in my guts. In the glass of water by my bed, I swear I saw concentric ripples à la *that* scene in *Jurassic Park*.

Peering out of the window of the eco-lodge where I was staying in the Pantanal, South America's vast tropical wetland, a pair of the weirdest birds met my gaze. Reminiscent of large, satanic turkeys, they seemed to fancy each other, as they bowed and honked and honked... and honked. Was this a love song of sorts?

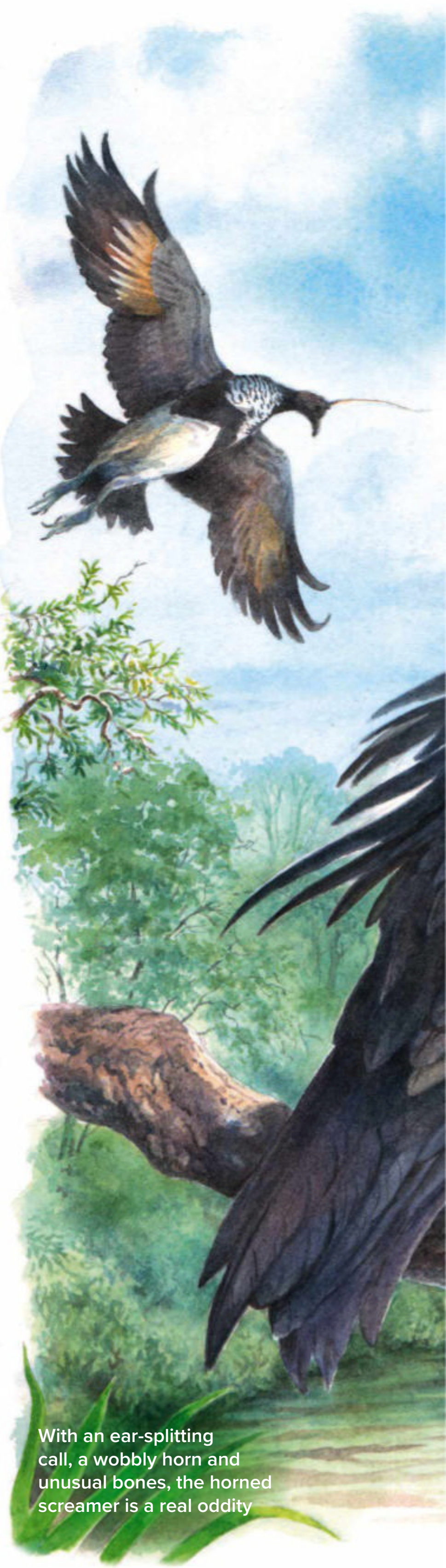
These peculiar birds were horned screamers (*Anhima cornuta*). And it turns out they are not just odd on the outside but on the inside, too.

There was no way I could get back to sleep now, so I watched them. Their performance lasted for the best part of an hour and died down for 15 minutes while the loved-up couple engaged in some mutual preening. When a third bird joined them, they resumed at full volume.

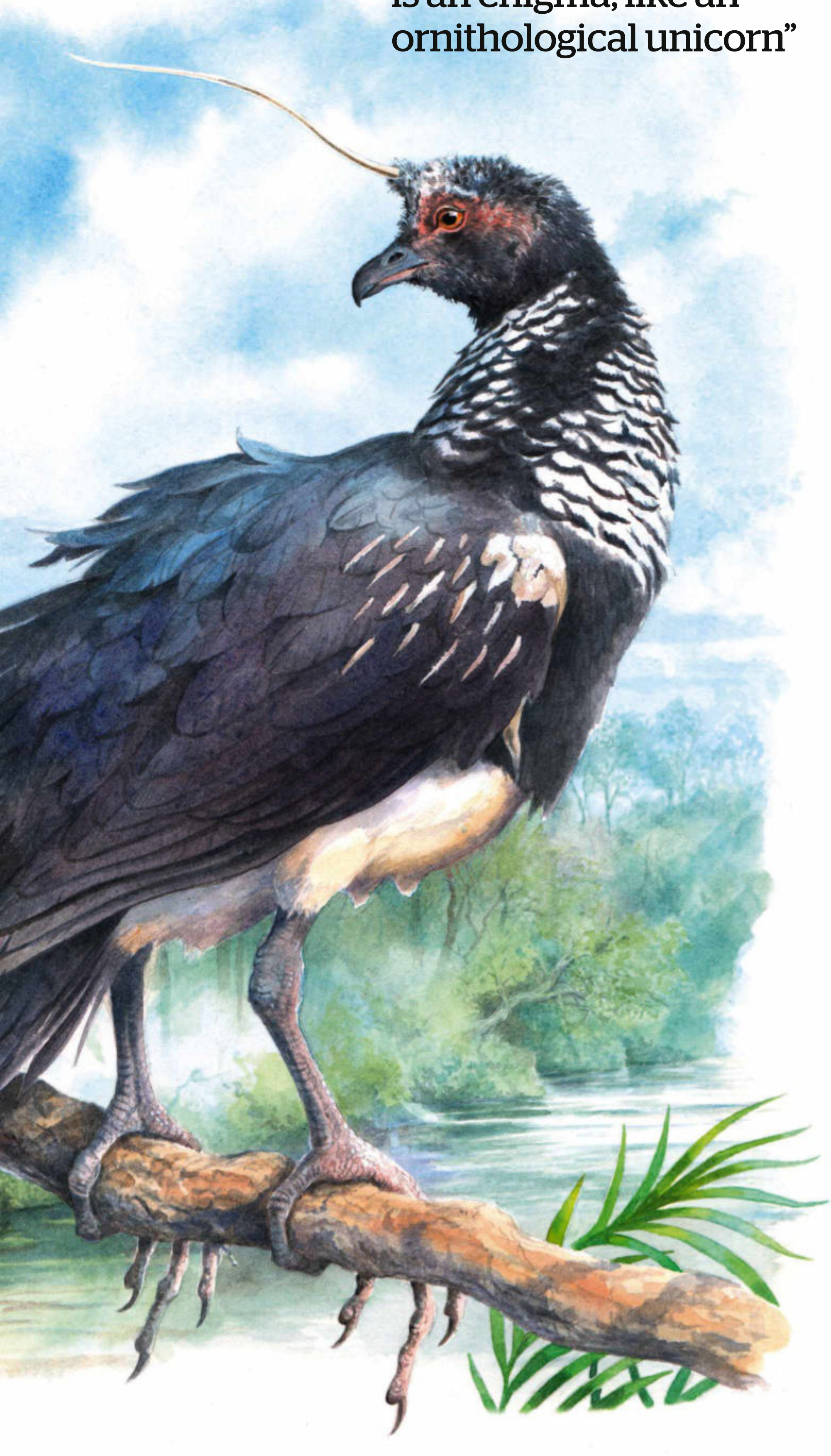
The ability to fill the air with its unmissable presence has given the horned screamer iconic status – it is called *el clon-clon* in Ecuador (an onomatopoeic name tag reflecting its call) and *Arauca* in Colombia, where it is the totem species of the municipality of Arauca.

Screamers are a family of three species – the southern, northern and horned. They are all a bit odd. They stand apart from their nearest relatives, ducks and geese, and by looking at them you would never guess their evolutionary kinship. For a start, there is no 'duck bill' but a robust, hooked one, reminiscent of a heavy game bird rather than a goose. They also have only rudimentary webbing at the base of their toes. This doesn't stop them from occasionally taking to the water, where they are good swimmers. They favour wet grasslands and are never far from shallow water – heavily vegetated swamps and lake edges are their domain.

The horned screamer is the weirdest of the trio – an enigma, like an ornithological unicorn. The hard-to-miss protuberance on its head sticks out at about 45 degrees and gives it its common English name. This long, thin 'horn' is neither feather nor bone but cartilage. Despite giving the bird a menacing appearance in photos, in reality,



With an ear-splitting call, a wobbly horn and unusual bones, the horned screamer is a real oddity



"The horned screamer is an enigma, like an ornithological unicorn"

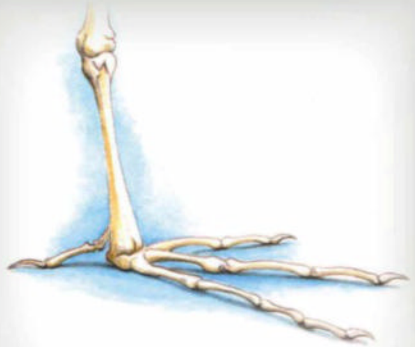
when you see it wobble as the bird moves its head from side to side, it's obvious that it isn't much use as a weapon. Only loosely attached to the bird's skull, the horn's sole purpose is display. It rarely gets more than 10cm long because, during the wear and tear of everyday activities, the tip breaks off. Watching a pair of birds, it appears they are 'air jousting' at times as they go about their head-bobbing, preening and posturing.

Another odd external feature of this bird is its spurs. Unlike its headgear, these sharp, bony spikes are effective weapons. They are not on the legs or feet, rather on the wings. Each wristbone brandishes a pair of these spikes, one longer and sturdier than the other. These armaments are most impressive in the males, with the long 'spur' often reaching around 6cm in length. It is thought that they are used to defend the bird's nest and territory.

The screamer also has hollow bones and a unique system of air pockets under the skin. Nobody really knows why this is. Some have hypothesised that it makes the bird lighter or is used to make certain social sounds or 'sonations' – intimate, low-frequency calls between mates.

At the other end of the sound spectrum to their big voice, screamers are known to make a peculiar crackling noise when they move. Like the sound of bubble wrap when you scrunch it in your hand, the sound is thought to be caused by the air pockets in the skin collapsing.

LOOK CLOSER



Screamer skeletons are full of air pockets

Honeycomb bones

Screamers may appear solid and sturdy, but their bones are very lightweight. In fact, for their size, they have some of the lightest and most pneumatic bones in the avian world. Most of their skeleton comprises a honeycomb-like system of air chambers, allowing the birds to soar long distances with ease.

ILLUSTRATIONS BY PETER DAVID SCOTT/THE ART AGENCY

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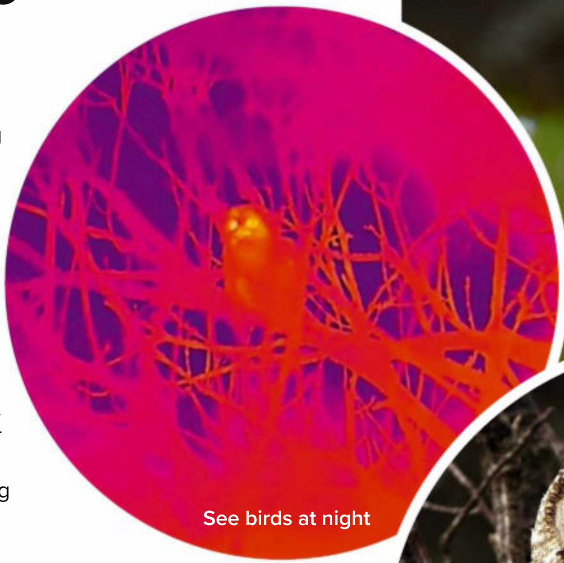

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Tawny owl

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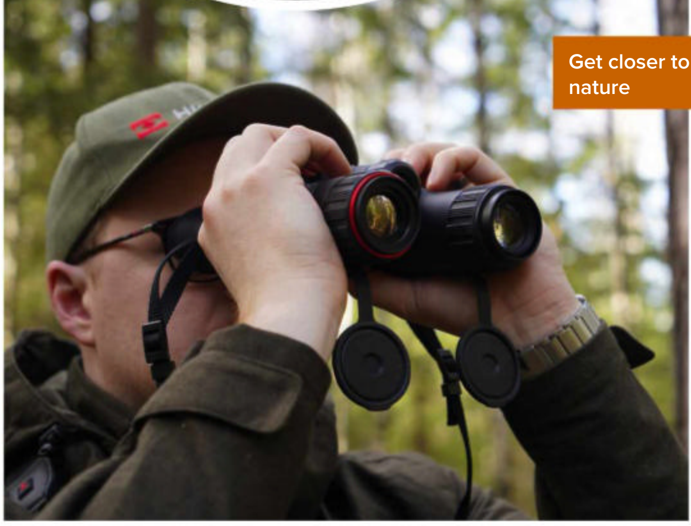

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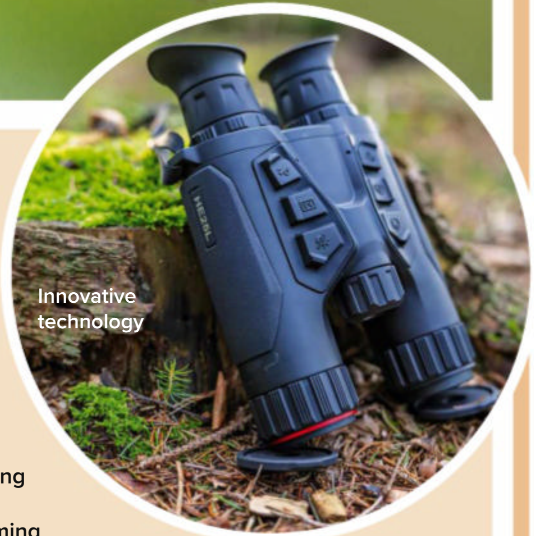

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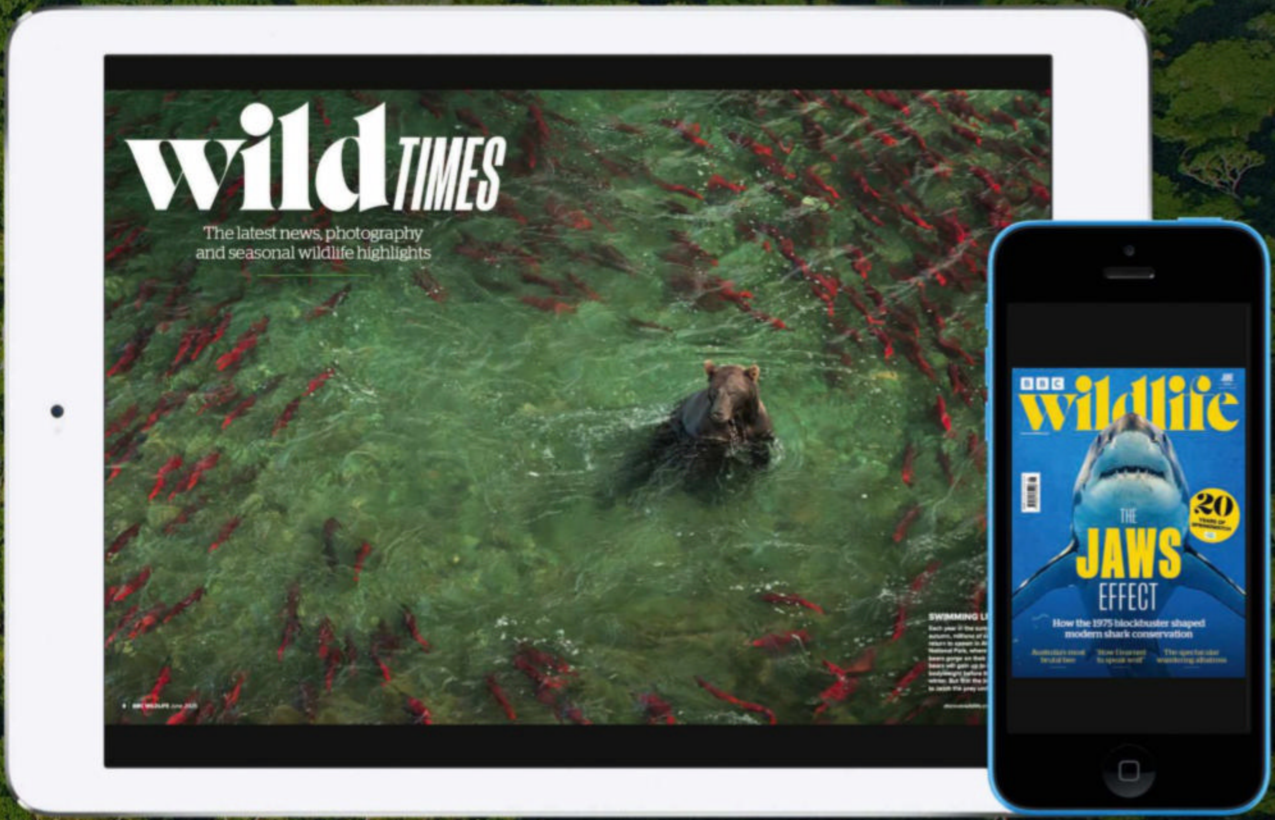
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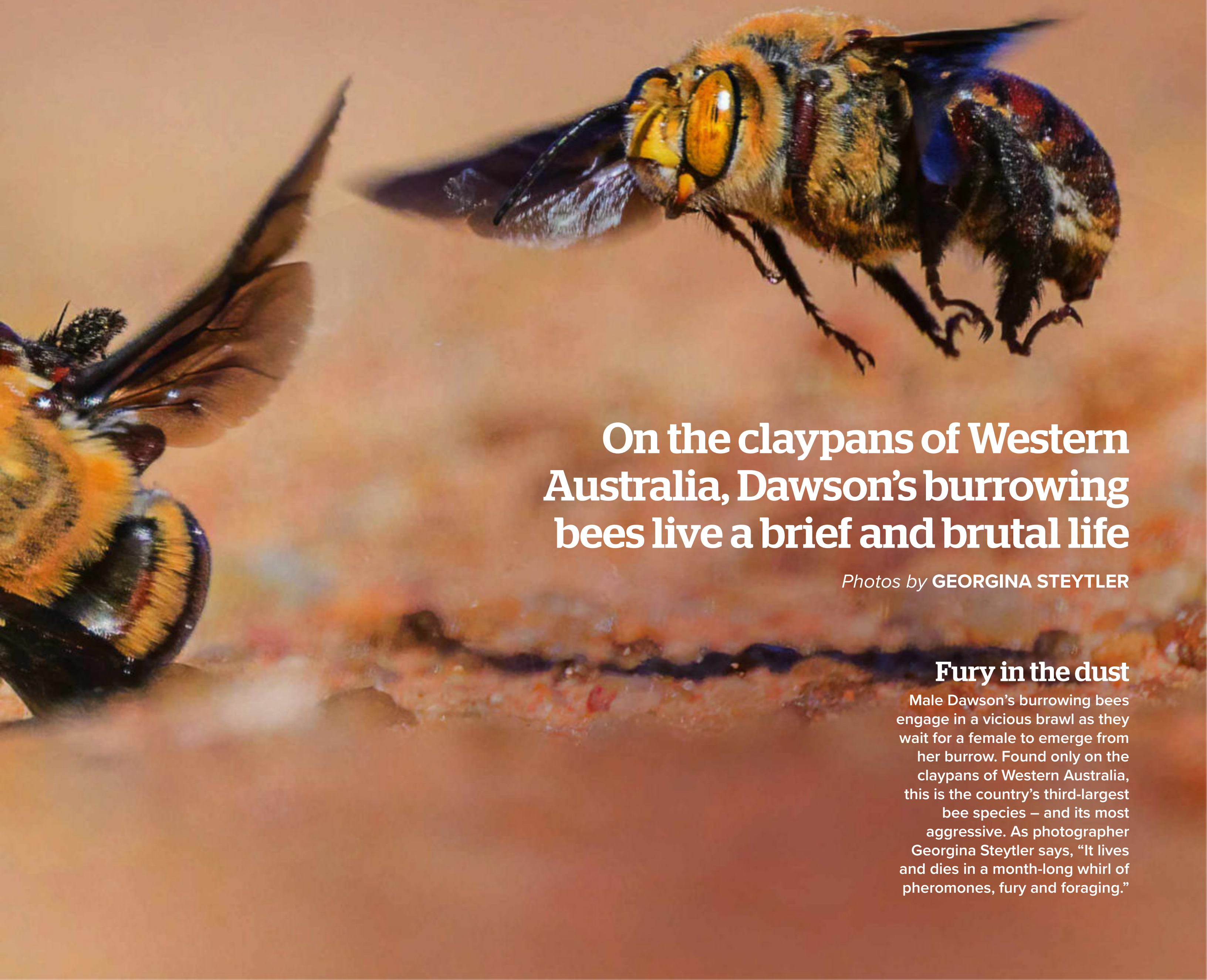
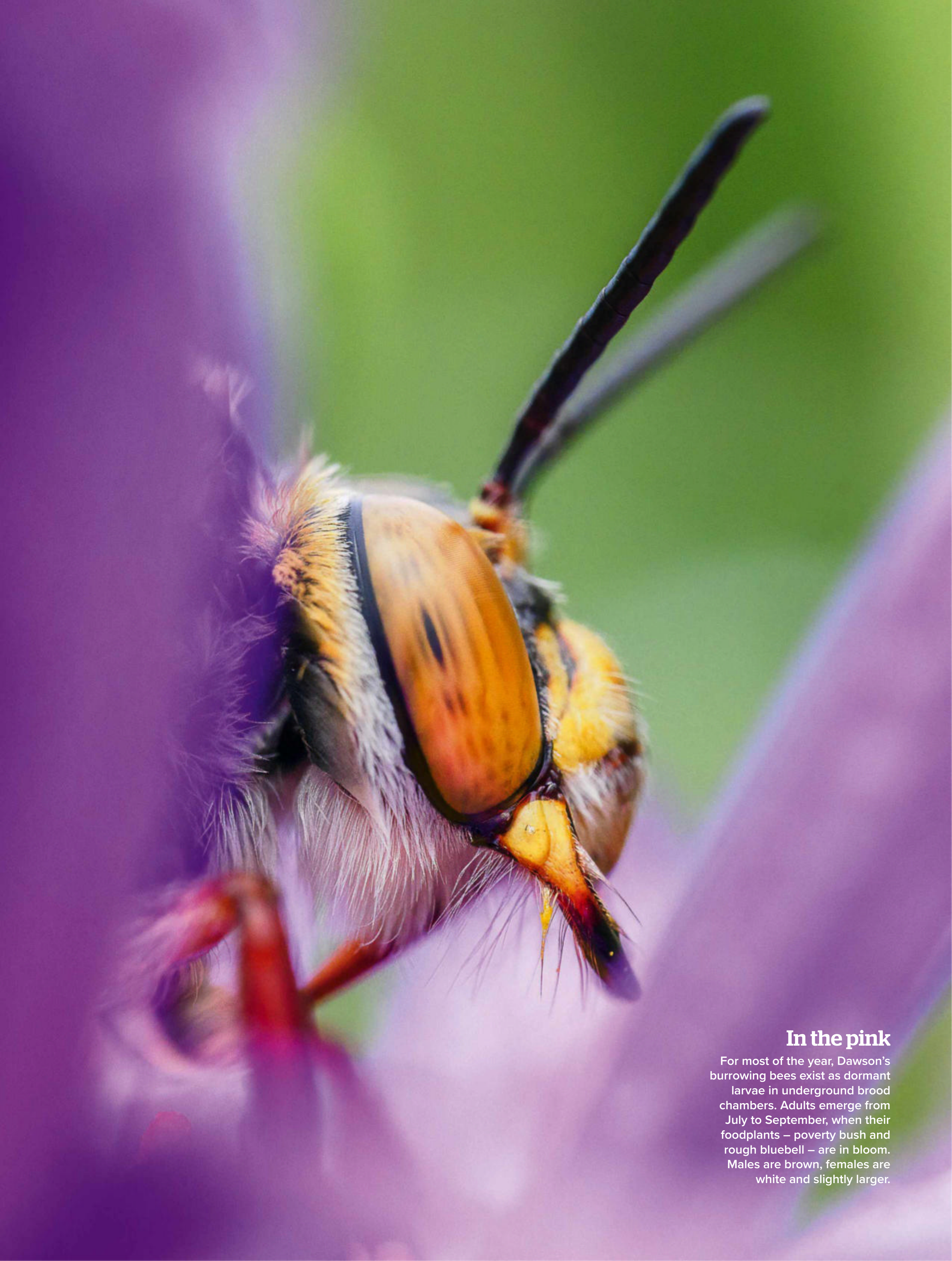


On the claypans of Western Australia, Dawson's burrowing bees live a brief and brutal life

Photos by **GEORGINA STEYTLER**

Fury in the dust

Male Dawson's burrowing bees engage in a vicious brawl as they wait for a female to emerge from her burrow. Found only on the claypans of Western Australia, this is the country's third-largest bee species – and its most aggressive. As photographer Georgina Steytler says, "It lives and dies in a month-long whirl of pheromones, fury and foraging."



In the pink

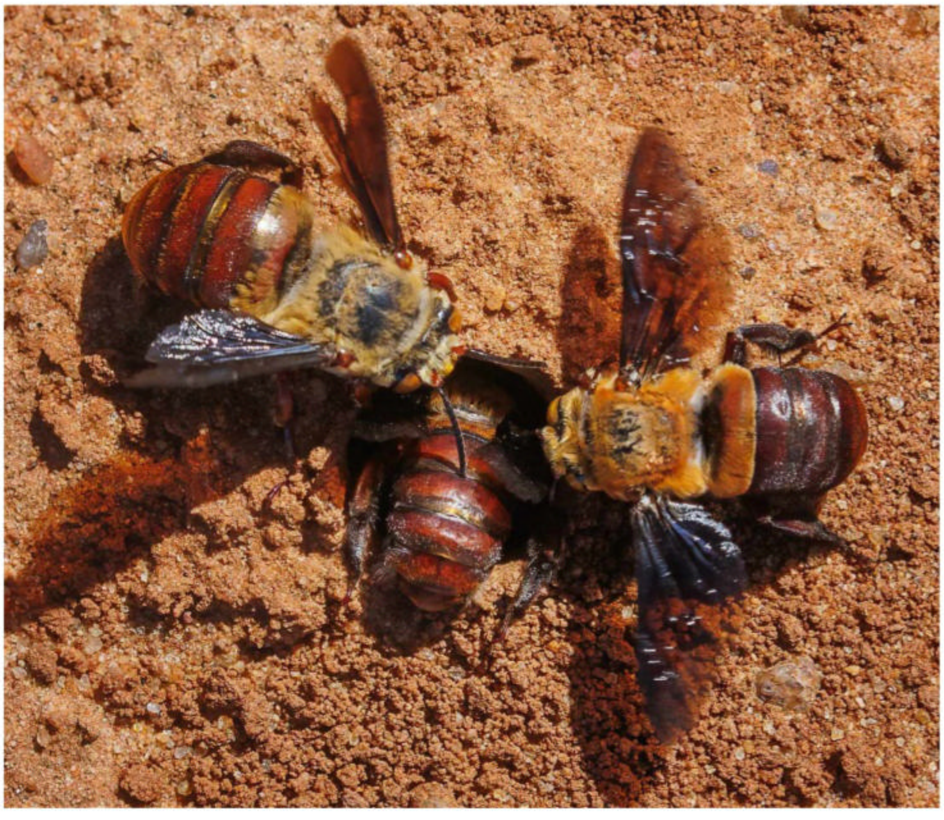
For most of the year, Dawson's burrowing bees exist as dormant larvae in underground brood chambers. Adults emerge from July to September, when their foodplants – poverty bush and rough bluebell – are in bloom. Males are brown, females are white and slightly larger.

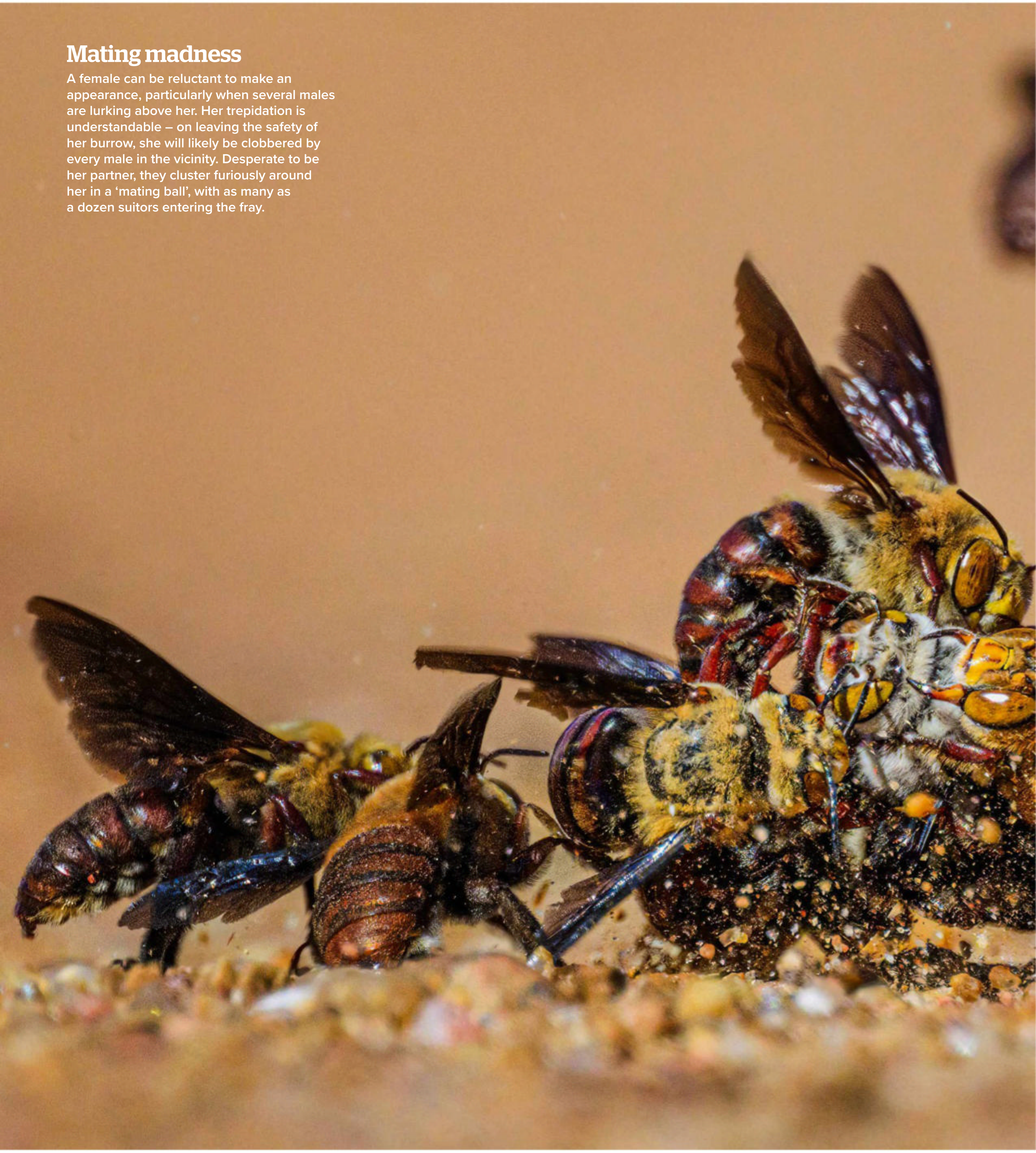
Going underground

These are solitary nesting bees, but gather in common areas to breed. Up to 10,000 individuals may nest in one location, excavating tiny burrows close together in the dusty ground.

Males in waiting

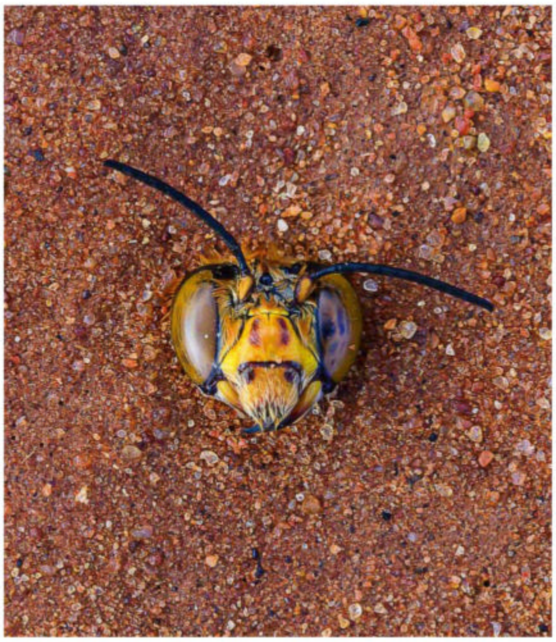
Males emerge first and begin patrolling the nesting ground. Virgin females emit a particular pheromone and when this is detected by the males, they stop and wait at the burrow entrance. Of the three suitors that have congregated here, one has actually entered the female's lair in an attempt to coax her out. Fights often erupt as the desperate males jostle for prime position.





Mating madness

A female can be reluctant to make an appearance, particularly when several males are lurking above her. Her trepidation is understandable – on leaving the safety of her burrow, she will likely be clobbered by every male in the vicinity. Desperate to be her partner, they cluster furiously around her in a 'mating ball', with as many as a dozen suitors entering the fray.

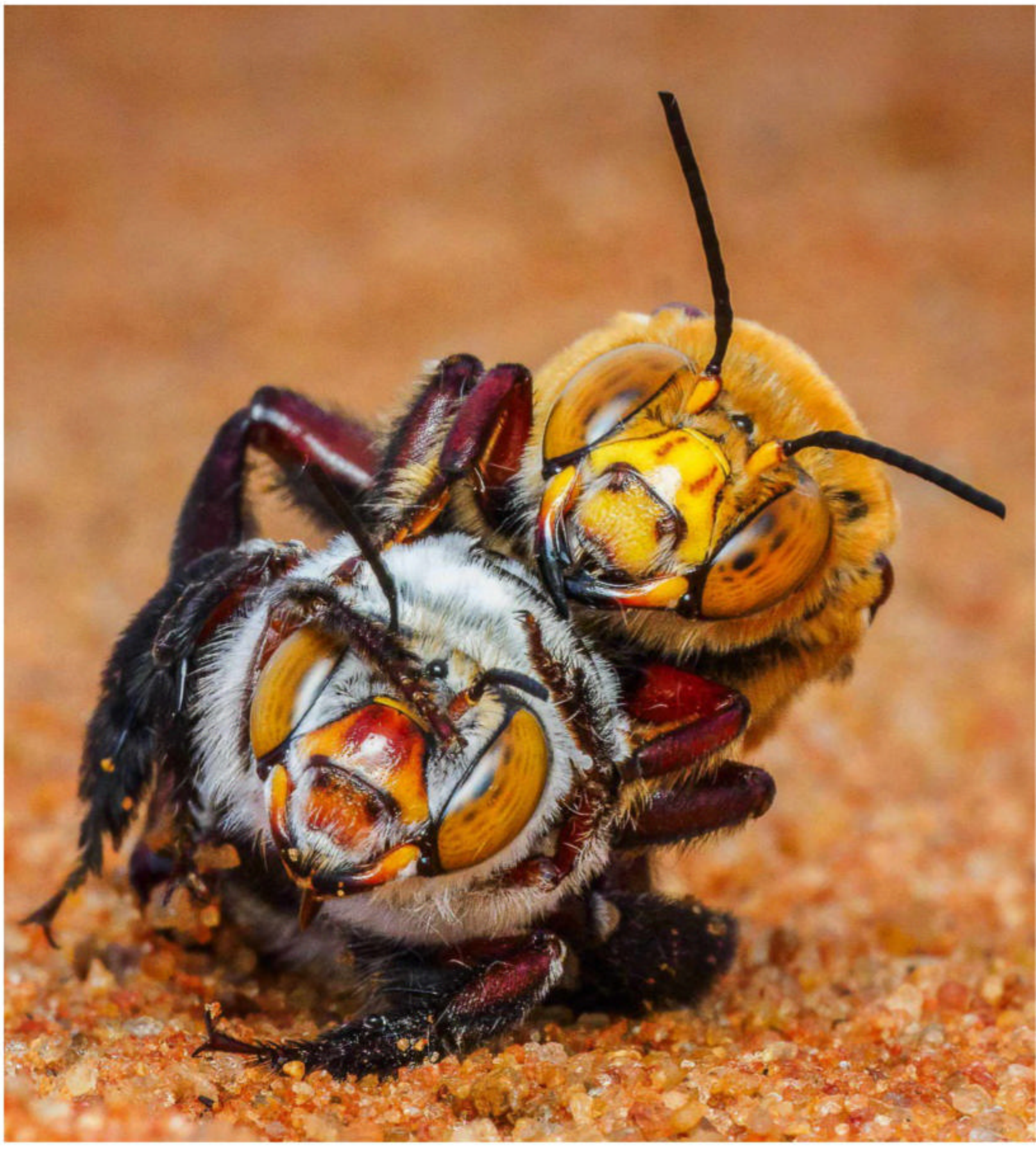


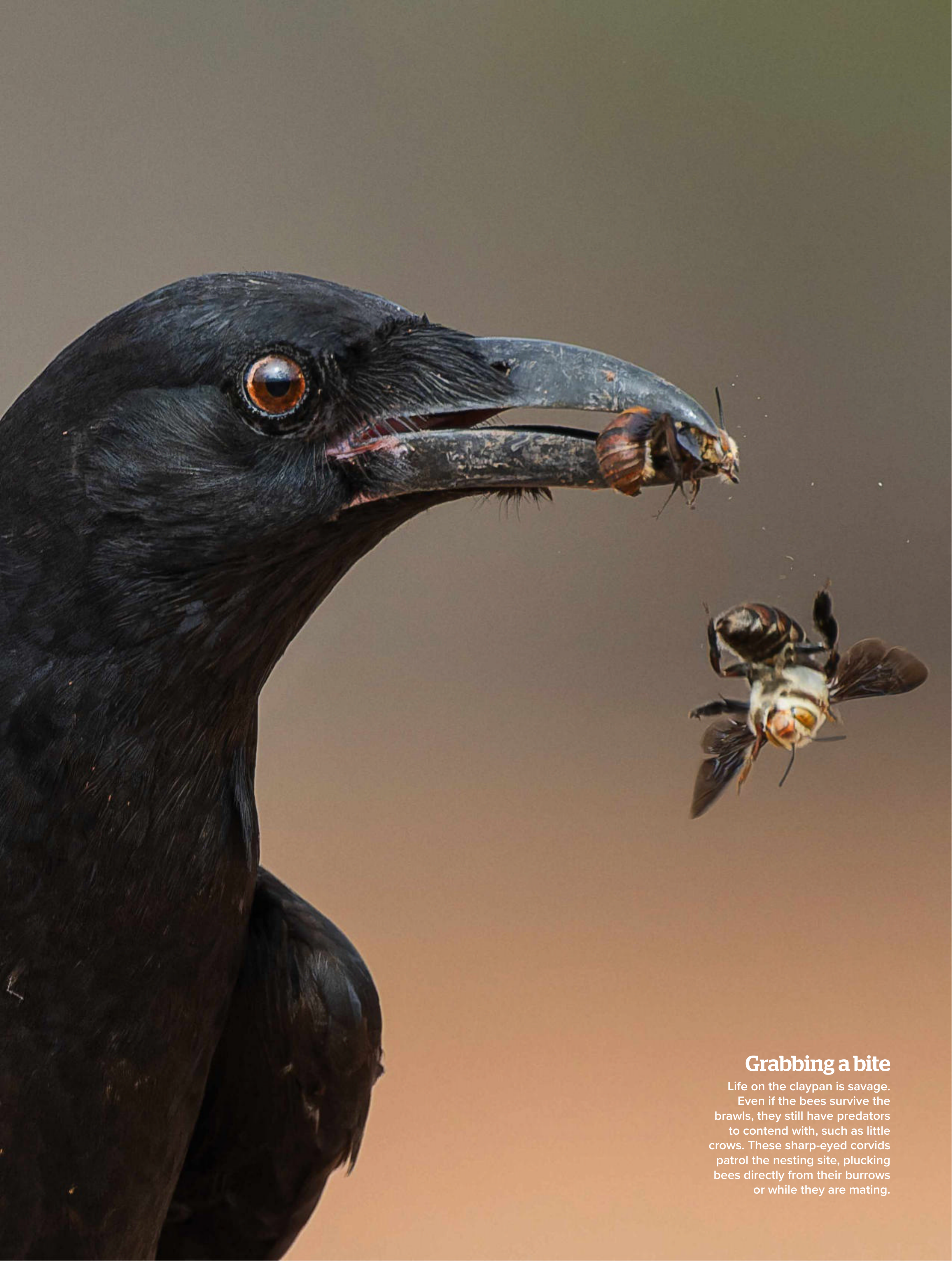
Death stare

So violent is the frenzy that bees can be decapitated in the process, with some males even attempting to mate with a female's headless body. "Scenes of death and dismemberment are common on the claypan," says Georgina.

Riding high

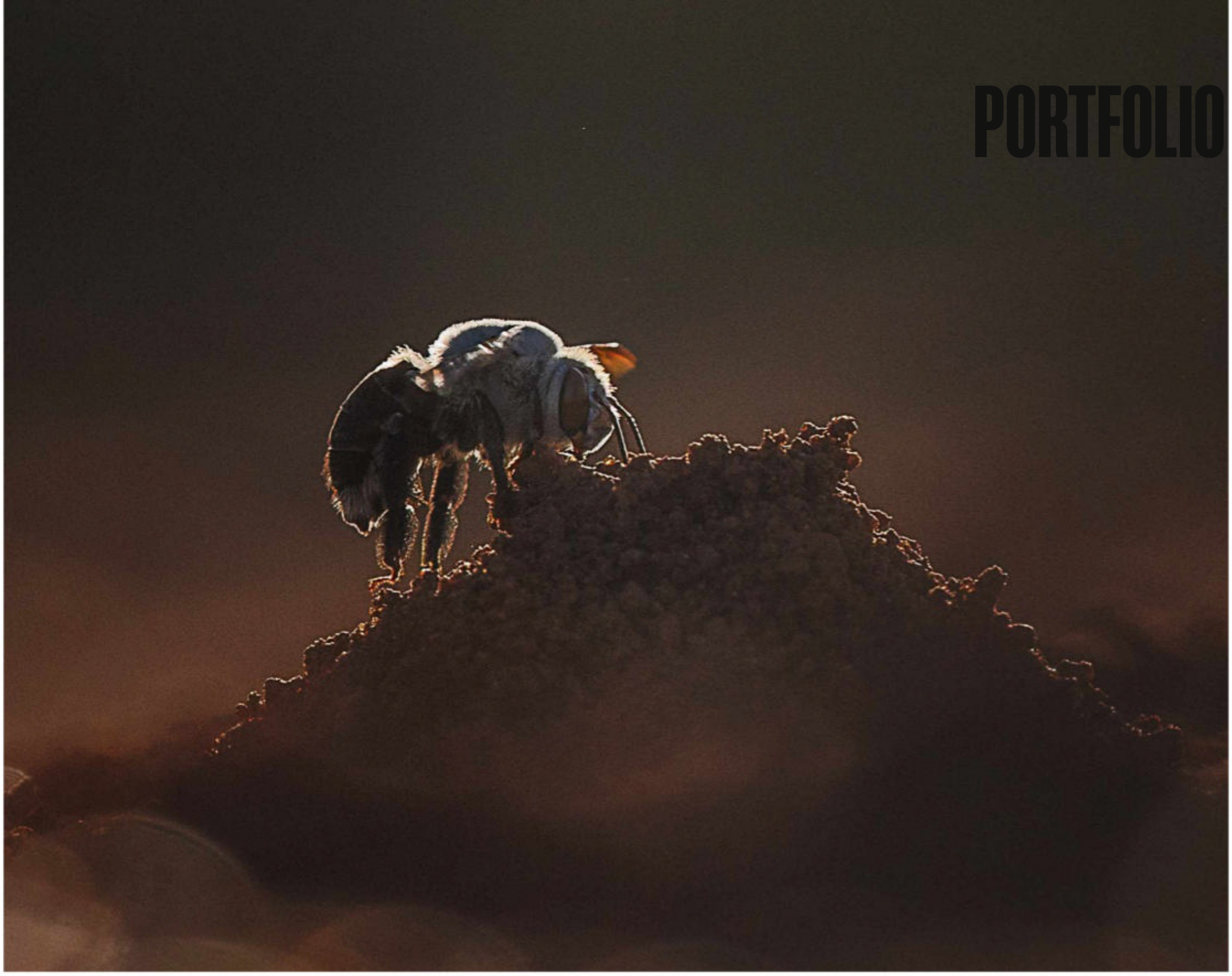
If the female survives the ordeal, she is eventually 'ridden' away from the scrum by the winning male. He guides her to the safety of the surrounding vegetation, where the pair stay until mating is complete.

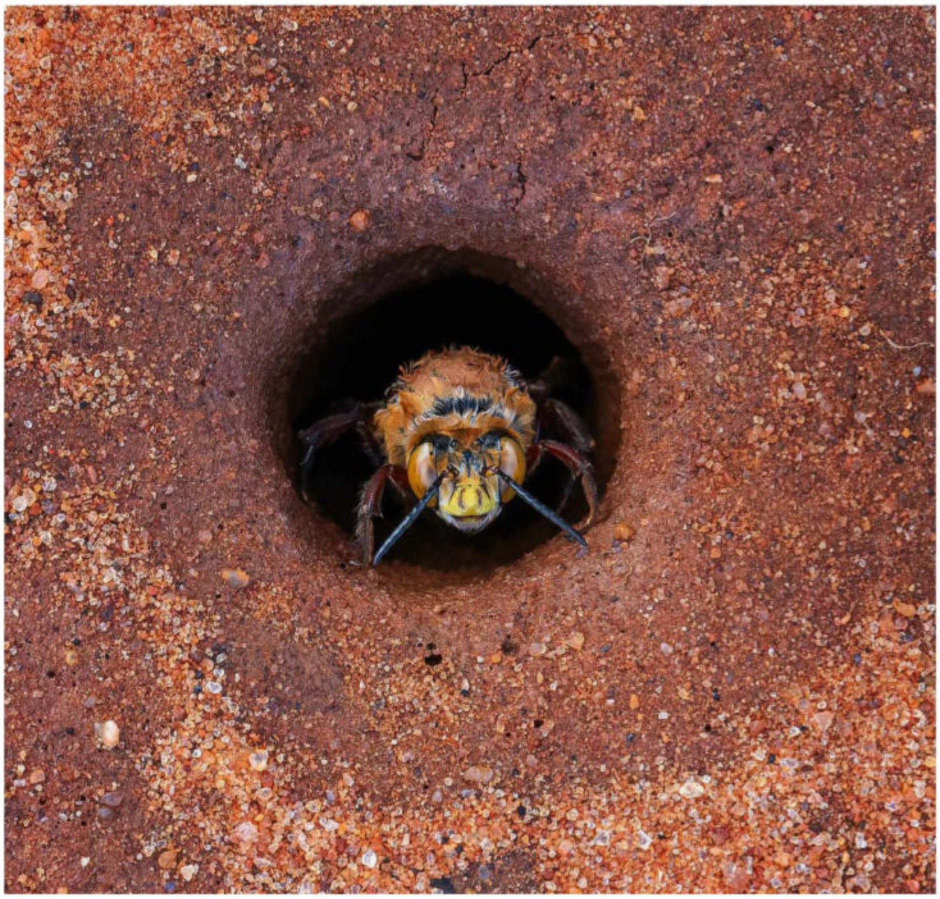




Grabbing a bite

Life on the claypan is savage. Even if the bees survive the brawls, they still have predators to contend with, such as little crows. These sharp-eyed corvids patrol the nesting site, plucking bees directly from their burrows or while they are mating.



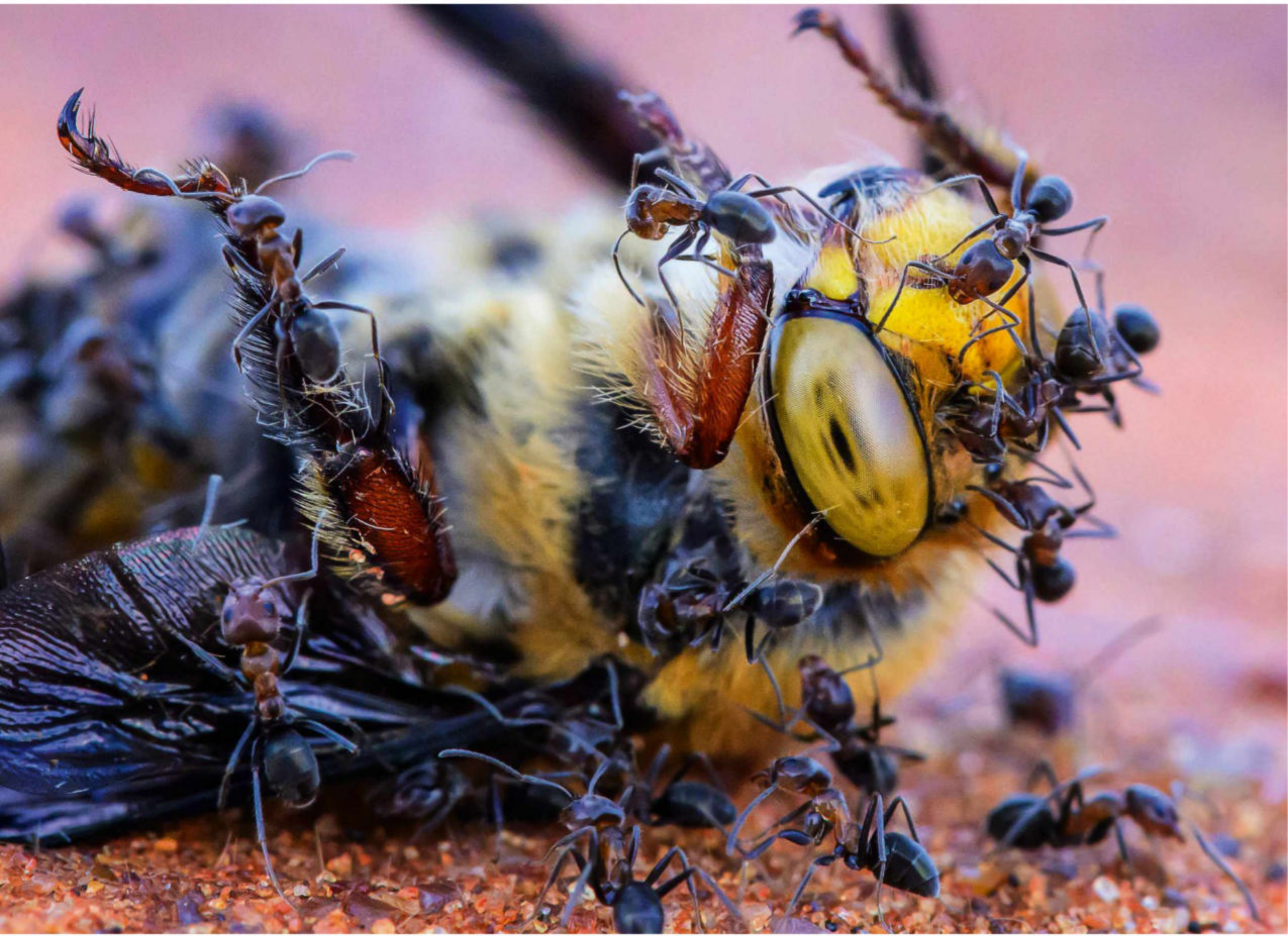


Setting up home

Once she has been mated, a female no longer produces the pheromones driving the males' behaviour and is left in peace. She now turns her attention to nesting, using her strong mandibles to dig a fresh burrow 15-20cm deep. At the bottom, she constructs an urn-shaped brood cell and waterproofs its walls with secreted wax. She half-fills the cell with foraged nectar and pollen, lays an egg on top, then caps the cell. After repeating this process up to seven times, she seals the burrow with a mud plug and demolishes the turret of excavated soil. Her work now complete, she dies.

Rain, rain...

A waterlogged male clambers out of his burrow following an unseasonal downpour. If a deluge is particularly heavy, the burrows flood and the bees can drown.

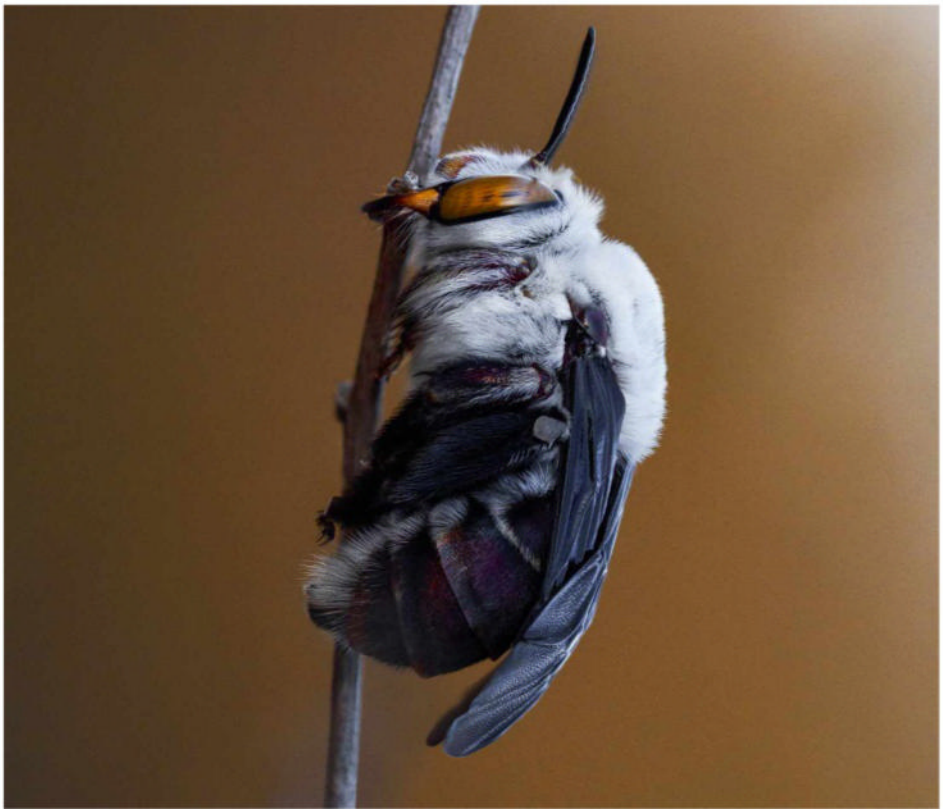


Clean-up crew

Once they have mated, the male bees die, and the scavengers move in. Meat ants are particularly efficient clean-up operators, quickly dismantling the carcasses and transporting them back to their colonies, piece by piece.

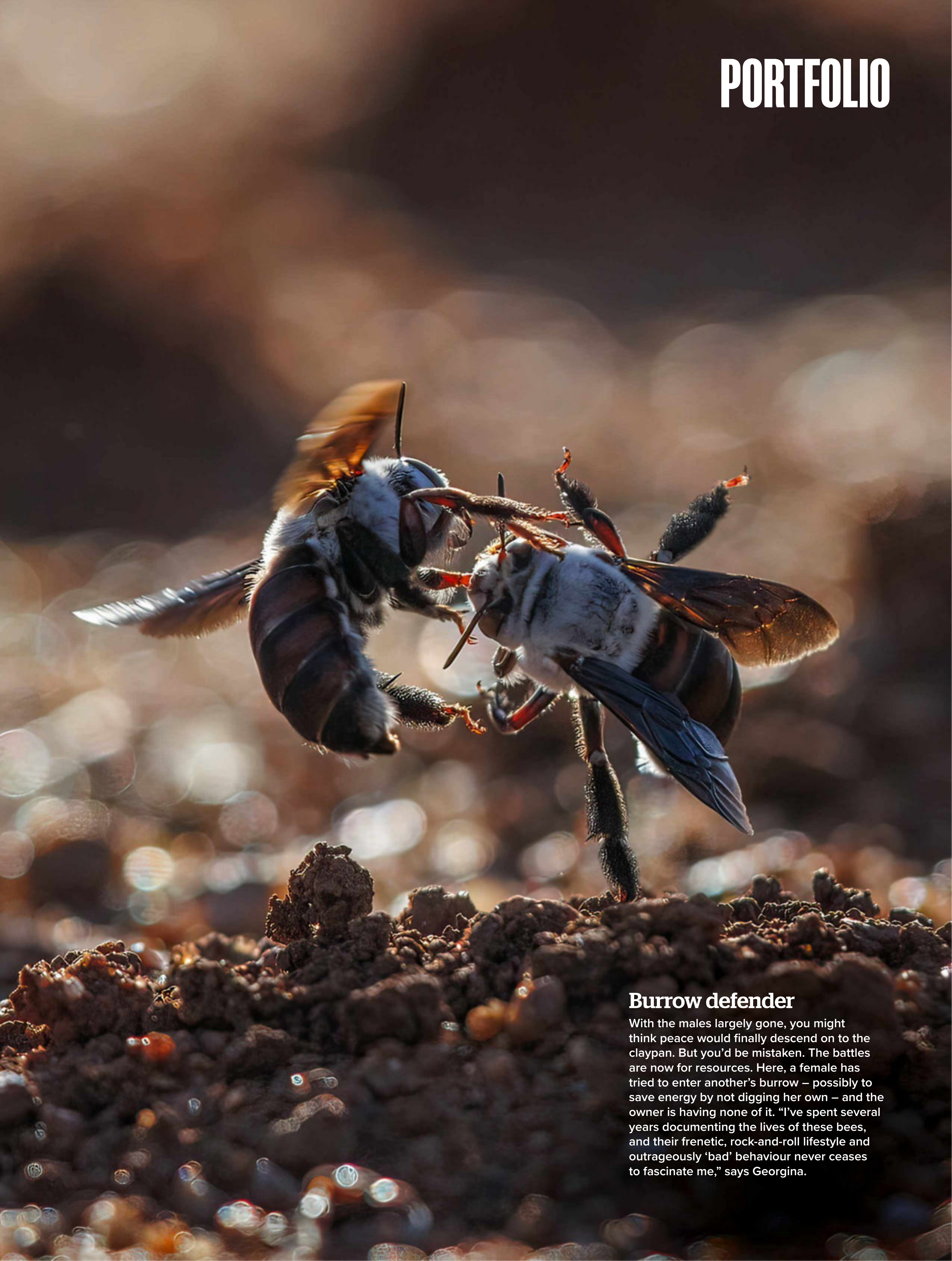
Rest and relaxation

As nesting season draws to a close, the claypan is dominated by the females. With few males remaining, unmated females roost on the vegetation, gripping the leaf tips or stems in their jaws and folding their legs neatly beneath their bodies.



ABOUT THE PHOTOGRAPHER

Georgina is a nature photographer from Australia. She loves teaching the art and joy of photography through workshops and talks.



Burrow defender

With the males largely gone, you might think peace would finally descend on to the claypan. But you'd be mistaken. The battles are now for resources. Here, a female has tried to enter another's burrow – possibly to save energy by not digging her own – and the owner is having none of it. "I've spent several years documenting the lives of these bees, and their frenetic, rock-and-roll lifestyle and outrageously 'bad' behaviour never ceases to fascinate me," says Georgina.

JAWS 50

THE LEGACY

Half a century after a great white shark terrified cinemagoers, we hunt down the lasting impacts of Spielberg's blockbuster

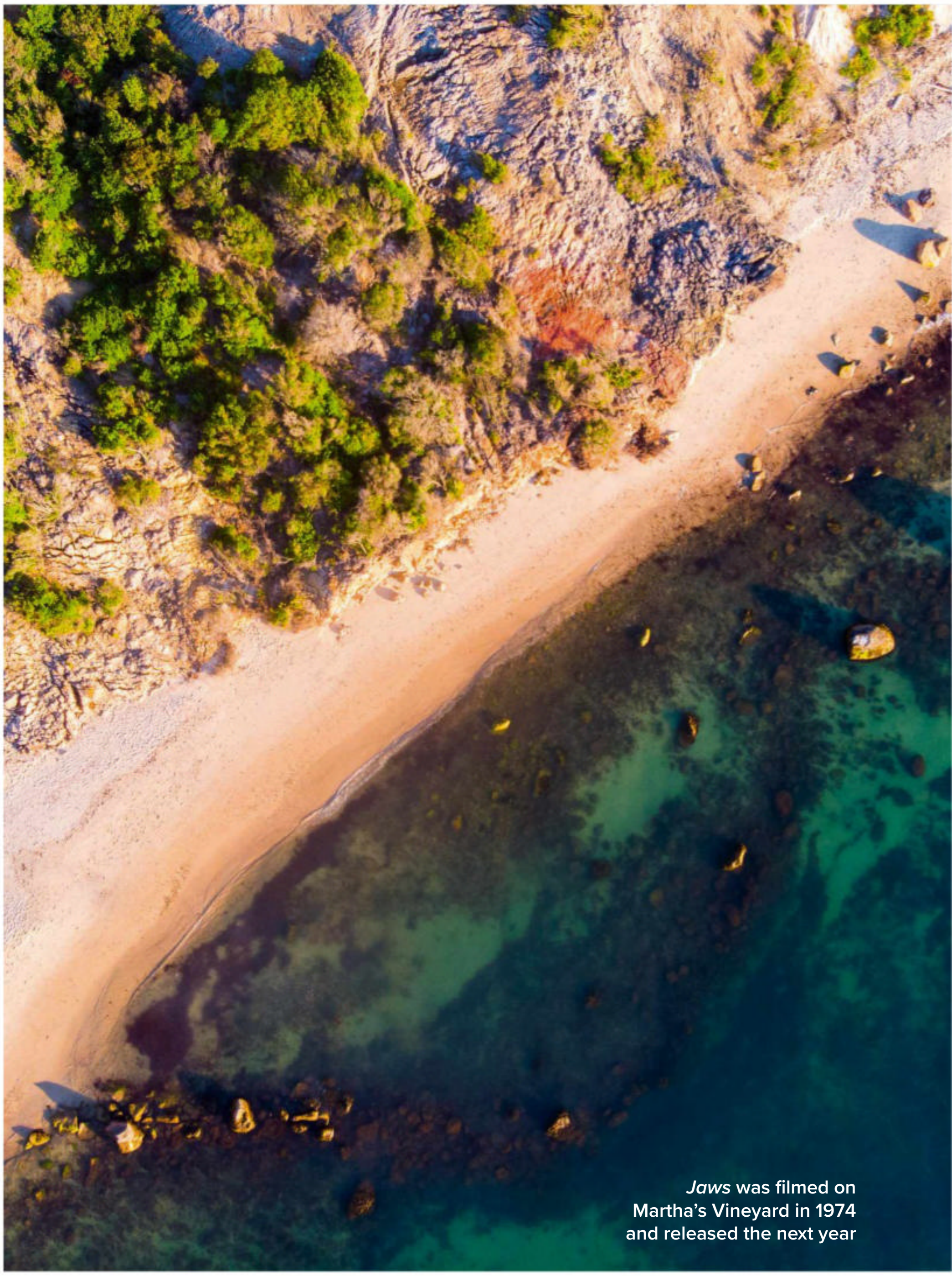
By **PAUL BLOOMFIELD**

A great white shark in the Pacific near Guadalupe in Mexico

GREAT WHITE SHARK: SUE FLOOD/NATUREPL.COM

SUMMER 1975 WAS A GLORIOUS TIME TO be young on the Massachusetts island of Martha’s Vineyard. “We had the beaches to ourselves – nobody else wanted to go in the water, not even a lot of people who’d lived there all their lives,” recalls Chris Lowe. “I was 12, and my friends and I thought it was awesome.”

White sharks feed on a wide range of prey, from small fish to dolphins



Jaws was filmed on Martha's Vineyard in 1974 and released the next year

Why were these shores so empty? Because they'd just suffered a series of lethal attacks by a great white shark – albeit not a real one. On 20th June, Steven Spielberg's *Jaws*, in which the idyllic island body-doubled for the fictional Amity, had opened in American cinemas – and savaged sharks' public image.

Jaws was a monster hit. Based on Peter Benchley's 1974 bestseller, it was the first film to gross more than $100 million at the box office, spawning the summer blockbuster. Three sequels followed, as well as numerous knock-offs – in fact, a 2023 study of 638 'creature features' found sharks were the most common antagonists.

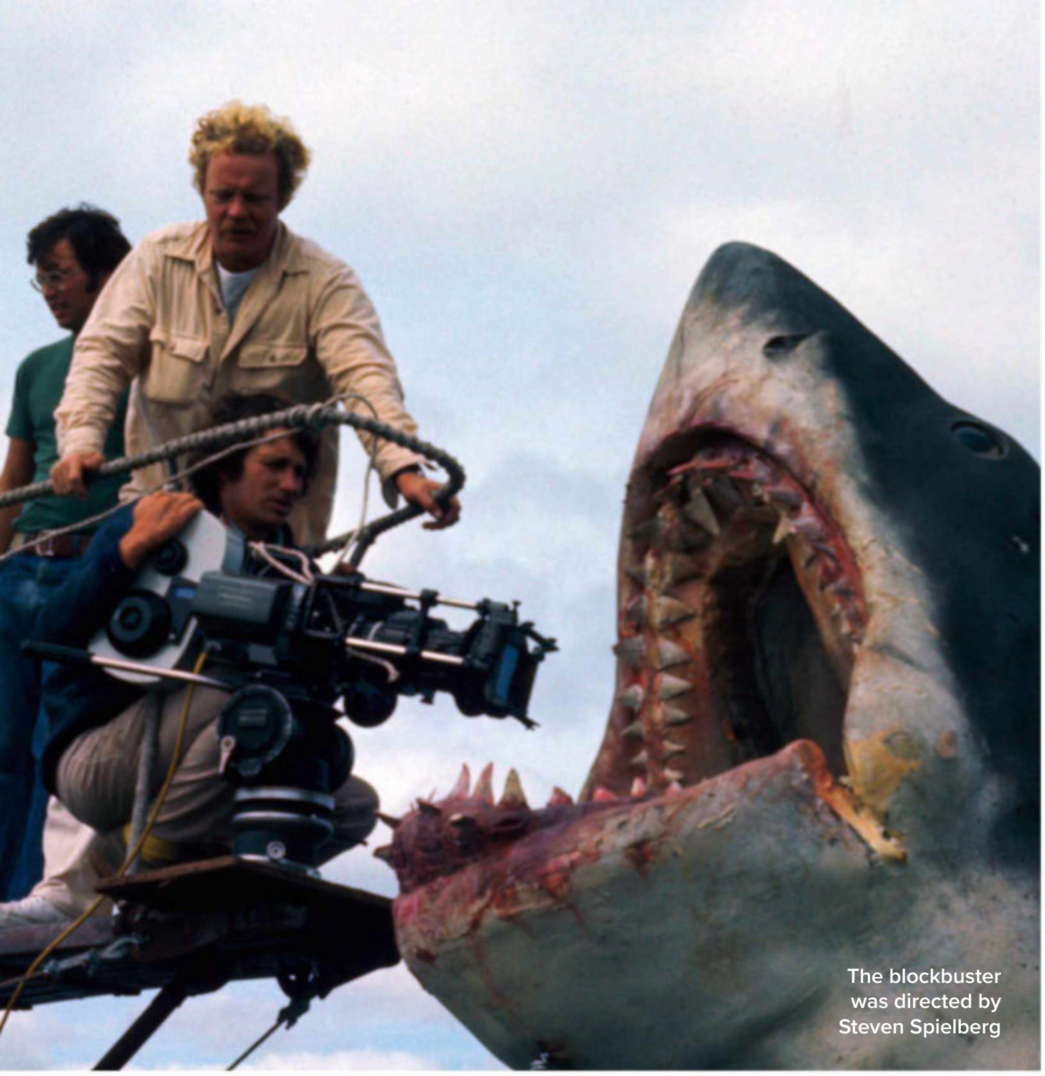
The film's impacts went far beyond moviemaking trends, though. As Lowe discovered, its 'villain' petrified audiences for decades, many heeding the tagline: "Don't go in the water."

"*Jaws* has had a pervasive and enduring influence on perceptions of sharks, especially great whites," says Brianna Le Busque of the University of South Australia, a specialist in conservation psychology. By the standards of modern horror flicks, *Jaws*' body count is relatively restrained: five (plus one dog). But there was another victim: the shark. Let's call him Bruce – the unofficial monicker bestowed on the animatronic model by the film crew, in homage to Spielberg's lawyer.

"The hunting of sharks increased significantly after *Jaws*, both formally and informally," says Gabriella Hancock, associate professor at the Department of Psychology at California State University (CSU). "Amateur anglers purposefully targeted sharks, taking psychological comfort in killing them with the justification that the animals were 'man-killers'.

"The number of shark-fishing and shark-killing tournaments also increased dramatically, especially on the US east coast." It's been estimated that the number of large sharks in the waters east of North America subsequently plummeted by half.

SHARK UNDERWATER: MIKE PARRY/MINDEN/NATUREPL.COM; MARTHA'S VINEYARD: WILLIAM CUNNINGHAM/ALAMY



The blockbuster was directed by Steven Spielberg

Sharks have been portrayed as a menace to beach-goers but have suffered at human hands

A biologist captures footage of a great white shark in Cape Cod

Peter Benchley wrote the novel on which the film was based

ABOUT THE AUTHOR

Paul is a writer and photographer based in the West Country. His work focuses on adventure travel, wildlife and conservation, culture and heritage.

JAWS FILMING: PHOTO 12/ALAMY; WHITE SHARK IN CAPE COD: BRIAN SKERRY/MINDEN/NATUREPL.COM

Super shark discoveries

In the half-century since *Jaws*, researchers have made a number of key discoveries about *Carcharodon carcharias*.

1 White sharks actually comprise three distinct groups
Recent genomic analysis revealed three distinct lineages of white shark. These groups, which probably diverged at least 100,000 years ago, rarely interbreed.

2 Big sharks may be hunted by even bigger sharks
Researchers last year encountered evidence that a porbeagle, a species closely related to a white shark, was predated by a great white shark or a shortfin mako.

3 White sharks are warm-bodied – in certain places
A few fast-swimming apex predators – including white sharks – are regional endotherms, which means they keep core body parts warm, unlike most other fish.

4 LED lights could deter attacks
Attacks on surfers are thought to be due to sharks mistaking them for seals. Research has found that attaching LED lights to seal decoys disrupted their silhouettes and deterred sharks from biting them.

5 White shark sex still remains largely a mystery
White shark mating has never been fully observed or recorded by scientists, though we do know that the male bites the female to get in position to transfer sperm.

> "Even Peter Benchley, who wrote the novel *Jaws*, recognised that there is no such thing as a rogue shark"

TRUE, BRUCE WAS A MENACE, to the production, at least. The mechanical model repeatedly malfunctioned, forcing Spielberg to rely on clever shark's-eye-view shots to create the film's potent sense of looming threat. Today, you can encounter the huge model at Los Angeles' Academy Museum of Motion Pictures. Bruce is well over 7m long – more than a metre bigger than any white shark reliably recorded. That, of course, is far from the only inaccuracy in the film.

Crucially, another is the idea of a 'rogue shark', dating back to a series of bites – four of which were fatal – in New Jersey in 1916, which scientists from the American Museum of Natural History attributed to one fish.

"That is simply not how sharks behave," says David Shiffman, interdisciplinary marine conservation biologist and author of *Why Sharks Matter*. "They don't stalk humans, and the idea of 'rogue sharks' that develop a taste for humans is pseudoscientific nonsense."

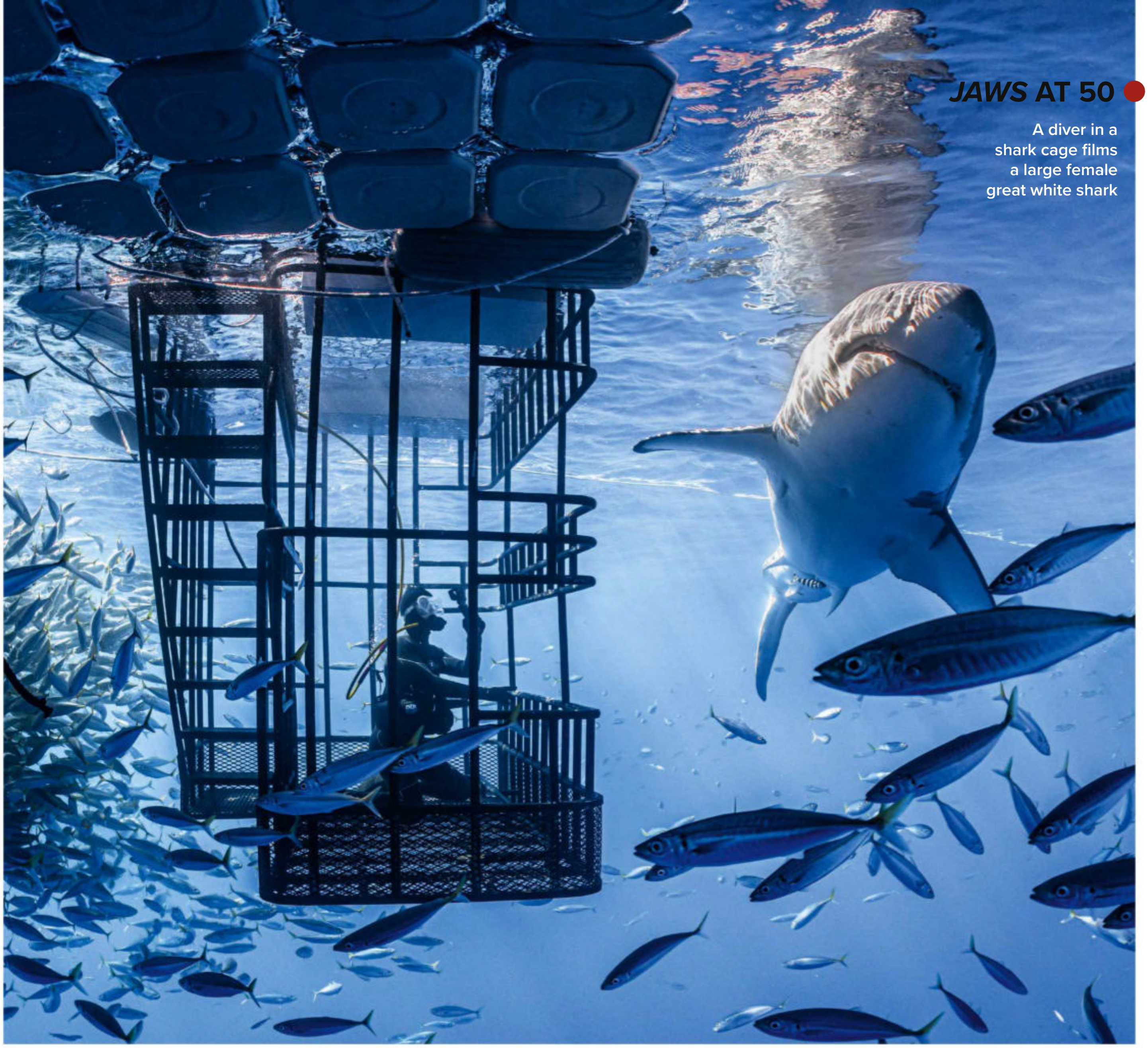
Even Peter Benchley recognised that "there is no such thing as a rogue shark", as his widow Wendy recalls (since Peter's death in 2006, she has continued the marine conservation work they undertook together). "Peter had a library of research books about sharks," she says. "Of course, there wasn't much information about them in the 60s and 70s but, even so, he wrote the book understanding that the 'rogue shark' theory was not validated by science. After *Jaws*, we worked hard to get people to understand that this was fiction – not a documentary."

On average, 63 people are bitten by sharks worldwide annually, of whom five or six die. "More people are bitten by other people in New York City each year than are bitten by sharks in the whole world," says Shiffman. "Every once in a while a person is hurt by a shark, and I don't want to downplay that. But it's extremely rare that someone is killed."

Jaws thrust these predators into public consciousness. Before then, "A few historical newspaper articles described sharks as

PETER BENCHLEY: NEW YORK TIMES CO/GETTY; GREAT WHITE SHARK: MARK CARWARDINE/NATUREPL.COM

Most attacks on humans are thought to be due to sharks mistaking surfers or swimmers for seals



A diver in a shark cage films a large female great white shark

‘monsters’ and ‘man-eaters’,” says Le Busque. “But it seems most people either didn’t think about sharks at all or were indifferent.”

“I think a key to *Jaws*’ success was that we knew so little about white sharks,” adds Chris Lowe, now director of the Shark Lab at California State University. “Not least because their populations had been vastly reduced – through fishing but also from loss of prey due to the hunting of marine mammals.”

> “Species that are feared or disliked receive less conservation support”

Rates of ‘galeophobia’ – a fear of sharks – soared, and remain high. A 2017 survey by Bite-Back Shark & Marine Conservation found that 64 per cent of British people would prefer sharks simply didn’t exist. Similarly, a 2015 study revealed that more than half of Americans are terrified of sharks, with 38 per cent scared to swim in the ocean as a result.

Of course, making people frightened of dangerous creatures is nothing new. “Back in prehistoric days, when hunters experienced a new predator, they would come back and tell stories about it around the fire,” says Lowe. “They were relaying information – and the scarier they made it, the better people listened. That’s why people love horror films. Neurologically, it has a purpose: your brain gives you a little shot of dopamine when you hear a scary story, because we’re one of the few animals that can learn about a threat by hearing about it from someone else.”

It’s a theme explored by sociobiologist EO Wilson. “We are not afraid of predators, we’re transfixed by them, prone to weave stories and chatter endlessly about them,” he said, “because fascination creates preparedness, and preparedness, survival. In a deeply tribal way, we love our monsters.”

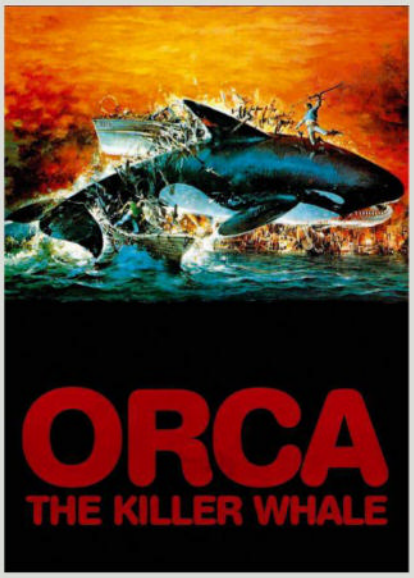
However, this can have negative impacts for nature. “People often make important decisions about shark conservation based on perceived rather than actual risk,” says Hancock. “And that is often based on fictional accounts of sharks and/or biased media coverage, because reports are disproportionately about negative occurrences such as shark-bite events.”

“Discussing what he dubbed the ‘*Jaws* effect’, social scientist Chris Pepin-Neff reported that animal species that are feared, disliked or deemed disgusting receive less conservation support,” adds Le Busque.

And they need conserving. Sharks are intensively fished for meat and other products around the world – for example,

GREAT WHITE SHARK BREACHING: CHRIS & MONIQUE FALLOWS/NATUREPL.COM; SHARK CAGE: HENLEY SPIERS/NATUREPL.COM

THE FILMS INSPIRED BY *JAWS*



Orca (1977)

The schtick: Vengeful killer whale pursues a fishing boat off Newfoundland.
The truth: Killer whales almost never attack humans in the wild, though people have died as a result of incidents with animals in captivity. Some orca have recently been recorded ramming boats.

Piranha (1978) plus sequels and remakes

The schtick: Killer fish savage guests at a holiday resort.
The truth: Piranhas are primarily scavengers of carrion, only very occasionally killing and eating larger mammals when starving and desperate.

Grizzly (1976) and ***The Edge*** (1997)

The schtick: Bloodthirsty bear hunts humans in the US wilderness.
The truth: Bears typically avoid people unless startled or cornered (despite recent alarmist headlines about bears developing a taste for humans in Japan).

Anaconda (1997) plus sequels

The schtick: Giant snake terrorises a documentary film crew.
The truth: There have been no documented cases of an anaconda killing and consuming a human.

> "The global abundance of oceanic sharks has declined by 71 per cent"

for shark-fin soup, served as an expensive delicacy, particularly in China, Taiwan and parts of south-east Asia. Since 2012, Bite-Back campaigning has led to 40 UK restaurants taking the controversial dish off menus and a UK ban on the import of shark fins, but threats remain. These include bycatch in bottom-trawling and purse-seine netting, and by 'ghost nets' and lines.

A 2012 STUDY ESTIMATED annual shark mortality at around 100 million, while research published in *Nature* found that the global abundance of oceanic sharks and rays has declined by 71 per cent since 1970. More than a third of shark and ray species are now threatened with extinction.

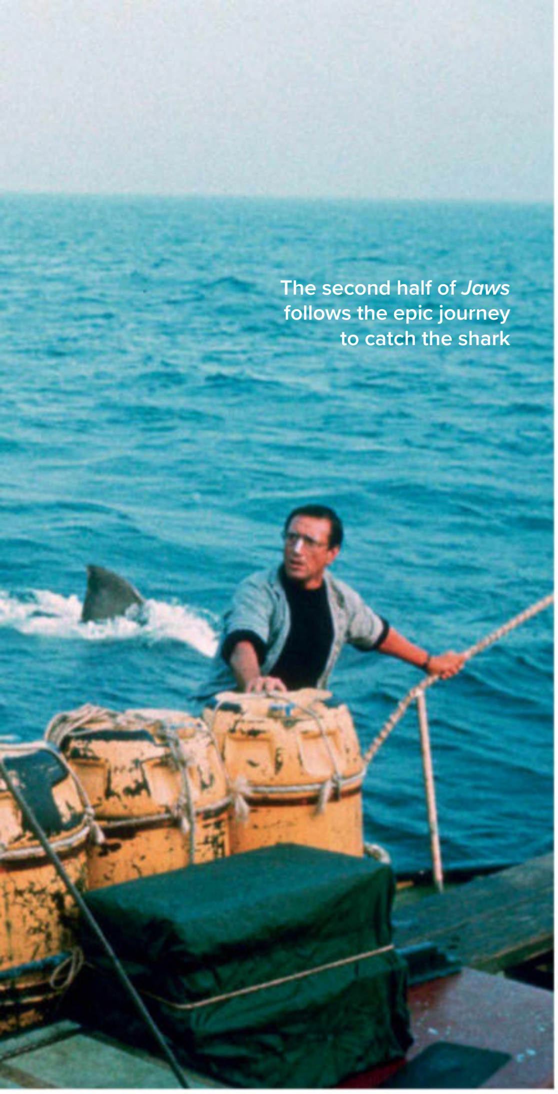
As for white sharks, estimating the global population of such a wide-ranging pelagic species is challenging. The IUCN classes white sharks as Vulnerable, with numbers falling. By some estimates, fewer than 3,500 survive worldwide, though numbers are increasing in some waters, such as the western Atlantic and north-eastern Pacific.

Why does this matter? Well, sharks have patrolled the oceans for at least 400 million years, helping maintain ecosystems, recycling and redistributing nutrients and even helping moderate climate change. "Sharks help keep the food web in balance in oceans and coasts – a food web on which billions of humans rely for food and jobs," observes Shiffman. "When you lose top predators, the whole food web can unravel in ways that are very difficult to predict but are often quite bad."

Jaws did have some positive outcomes. "One of the wonderful things that happened right after *Jaws* was that thousands of letters came in from people all over the world, telling us how fascinated they were with sharks and how much *Jaws* made them want to be [oceanographer] Matt Hooper," says Wendy Benchley.

"*Jaws* was the first time a scientist was the lead hero in a movie, and the first time that a marine biologist was on the big screen at all," says Shiffman. "Many scientists cite

ORCA POSTER: PARAMOUNT/CINEMATIC/ALAMY; *JAWS* STILL: UNIVERSAL PICTURES/ZANUCK BROWN PRODUCTIONS/RGR COLLECTION/ALAMY



The second half of *Jaws* follows the epic journey to catch the shark

This sub-adult white shark nears the coast in Monterey Bay, USA

Hooper as the reason why they wanted to go into this field."

Their research is revealing new insights into these species – in part because of fears of white sharks. "Over the past 20 years, technology available to shark researchers has just exploded," says Lowe. "But it's expensive, so we're always fighting to get money. White sharks are among the best-studied species: people want to learn about them because they can cause injury."

A warning to swimmers on a Sydney beach

WARNING
SHARK
SIGHTED

Unfortunately, sharks continue to suffer from an image problem. "Of all films depicting sharks across various genres, 96 per cent overtly portrayed shark-human interactions as threatening," says Le Busque. And other media depictions often reflect these attitudes. "Language used when discussing sharks is noticeably different from that used when referring to other species. In news coverage of shark bites, these animals are often described as monsters, and wording suggests that they intentionally hurt people, whereas reports of other animal 'attacks' often paint them as accidents."

"If, for example, a newspaper publishes a drone photograph of a paddleboarder with a basking shark cruising nearby, the headline will likely read, 'Enormous shark prowls, terrifies or encircles paddler,'" says Graham Buckingham, founder of Bite-Back, which has produced guidelines for media covering sharks.

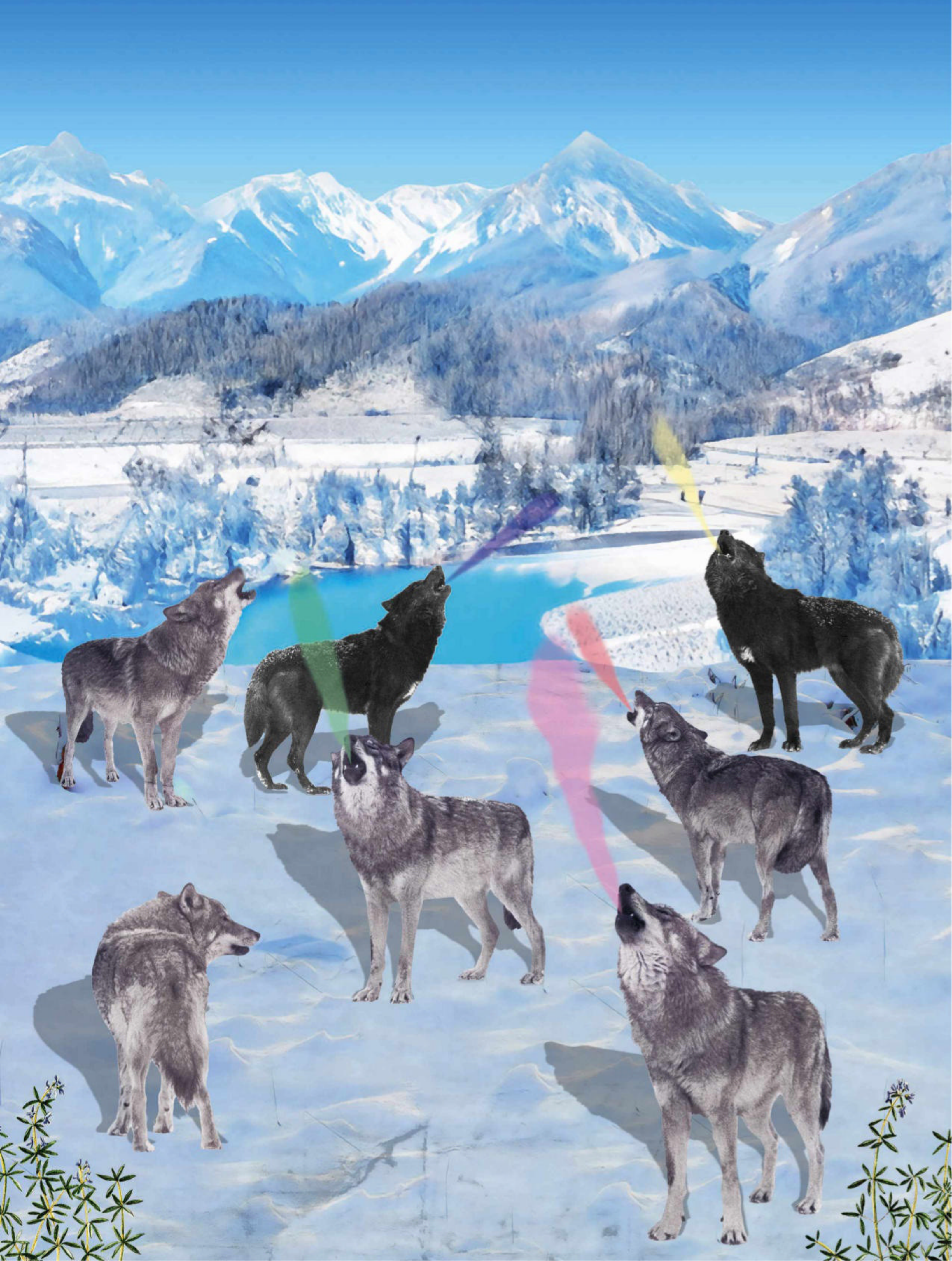
How can we remedy this bias? A study by Shark Lab and CSU researchers found that encountering a shark in the wild significantly increases tolerance and support for conservation.

"I wish everybody could enjoy the thrill of being in a cage as a couple of female great whites swim by," says Wendy Benchley. "I'd hope that the experience of seeing them up close would then transfer to the general population, and that they would understand the ecological importance of this apex predator. Because we need hundreds of millions more sharks in order to ensure the long-term health and proper balance of our global oceans."

REHABILITATING BRUCE IS far from impossible. Just look at the reputational turnaround of other large marine creatures. "If you asked people in a coastal town in the UK or New England 150 years ago about whales, they'd call them demonic animals that kill people," says Lowe. "The reason they were feared was because nobody saw them there – they were already hunted out from inshore waters. Those who went out to sea to hunt them, often on small boats, would sometimes die as the whales tried to defend themselves. So sailors would tell horrible stories.

"By the 1970s, whale populations had plummeted and only factory ships were used, so nobody died hunting them. Then people learned that these are intelligent animals, with language and family structures. Suddenly whales had a total PR makeover, and attitudes turned upside-down. The same could happen for sharks."

WHITE SHARK NEAR COAST: CHASE DEKKER/NATUREPL.COM; SHARKS WARNING SIGN: A PERIAM PHOTOGRAPHY/ALAMY



How I learned to speak wolf

Deep in Yellowstone's Lamar Valley, George Bumann develops a sense of what wolves' howls can mean

By **GEORGE BUMANN** *Illustration by* **LAURINDO FELICIANO**

I STOP SHORT OF TAKING MY NEXT STEP. Somewhere amid the squeak-crunch of snow beneath my boots and the footfalls and heavy breathing of our labrador, Hobbes, there is something else. The two of us stand motionless as I pull my wool cap up and away from my ears. I can't help but smile, noticing that both Hobbes and I are tilting our heads the same way, straining for the next sound.

There it is. This time, there is no doubt – it is the distant howl of a wolf. The faint sound is at the very edge of my hearing. Starting low, it reverberates and builds. It is not the vocalisation of a single individual after all, but howls from an entire pack. What I am hearing is the quintessential call of the wild emanating from some unseen corner of the upper Yellowstone River valley.

Anne Fernald, a professor at Standford University who specialises in children's language development, has deliciously referred to sound as "touch at a distance". This notion strikes a chord with me, pointing to what can connect us with the more-than-human world.

My own explorations into the conversations of wolves began more than 20 years ago in the heart of Yellowstone's northern range on the spectacular sprawling floor of Lamar Valley, the epicentre of the wolf recovery in the park that began in the mid-1990s. My wife Jenny and I lived in a small cluster of cabins – the only human outpost for several miles. During our first spring in the valley, the matriarch of the Druid Peak wolf pack gave birth to a litter of pups a few hundred metres to the east. We watched spellbound as the pack travelled, hunted, played, fed their young, forded rivers and streams, slept and, yes, howled. One thing was evident from the beginning – one howl was not the same as another. I couldn't help but wonder, "What are you saying?" Fortunately I was perfectly placed to find out.

The process of learning wolfese, or any language, is best done within the culture in which it is used. Humans, like bats, whales, dolphins, seals, parrots and songbirds, are vocal learners. We come to our mother tongue by repeating what we hear. I intuitively fell into a new language by repeating the howls of wolves not only as a way to uncover the nuances in those sounds, but also as a way to remember my lessons better.

I never howl to the wolves themselves and I howl exclusively indoors or inside a vehicle. For one thing, it is illegal to call to animals inside the park. But even when I am beyond park borders, I refrain because I still don't know exactly what I'm saying,

ABOUT THE AUTHOR

George lives near Yellowstone National Park and is a sculptor, animal language expert and the author of *Eavesdropping on Animals* (Greystone Books). Find out more about wolf howls at thecrywolfproject.com.

GEORGE BUMANN: JENNY GOLDING

and, more to the point, I don't want to inject myself into the wolves' lives and risk changing their natural behaviour. Some might scoff at the idea of making animal sounds as somewhat childish, and by some measures it is, but mimicry is one of the more noble of our youthful tendencies. Participating in what others do and say builds empathy.

After the walk with Hobbes, I break into wolf song inside the house. I fill my lungs with air and press upward with my diaphragm to unleash a replica wolf howl using a vowel sound reminiscent of 'wooooaaaaah'. Hobbes comes into the room to watch and listen, one eyebrow raised.

If someone happens to break into birdsong or the calls of a red deer at a social gathering, they will likely be laughed at or even mocked. If that same person were to give a recitation in Latin, Mandarin or Urdu, they would likely be viewed as worldly or sophisticated. Our limited standards of inclusivity are a malady of modern society that older cultures rooted in the land do not share. Non-humans are not beneath us. With their abilities to fly, breathe under water, see in ultraviolet wavelengths, hear in ultrasonic frequencies, detect odours with concentrations as little as parts per trillion, these speciose 'others' exceed us in extraordinary ways.

A typical wolf howl, based on an analysis of a year's worth of 24/7 audio recording in Yellowstone, lasts an average of six seconds. When the pack howls as a group, the vocalisations expand to include a raucous combination of individual moans, yips and barks, together with a chaotic modulating rising and falling sound referred to as a 'woa'. The choral arrangement of a wolf pack creates a sound that is larger than the sum of its parts. My baseline for understanding all other wolf vocalisations started with this group howl.

When is it appropriate to howl in wolf society? Is there an equivalent to the faux pas of attending a fine dining engagement and announcing something uncomfortably inappropriate about your private life? I'm not entirely sure to be honest. Though the circumstances in which wolves howl are myriad – and, no, they don't howl at the moon – wolf howls are most commonly used as rallying calls for pack members, exchanges between packs and to signal a change in pack behaviour. Barry Lopez reported many variations of howling behaviour in his book *Of Wolves and Men*, including one example of a wolf so deeply committed to participating in the group chorus that it called out while in the midst of defecating.

More generally, wolves act like a team of athletes doing a high five and a cheer before taking to the field. If a group of wolves hears another pack's call, they howl. If the group is bedded down and stands to travel, they howl. If they're travelling and circle up for a rest, they howl. When wolves are on a hunt, however, they are silent. After eating their fill and seeking out a place to lie down – their swollen bellies may contain upwards of 9kg of meat, which is a lot for an animal that weighs only 45kg – they often howl.

Tuning into deviations from these common patterns helps me further crack the wolf code. Let's revisit that morning walk with Hobbes. As if by magic, a second wolf howl pierces the wintry air from the rolling hills at the base of a peak roughly 1.5km to the east of the pack. The single wolf starts with a short, high note that breaks into a lower register for a sustained interval. The six-second norm for a wolf howl is now being stretched for 12 to 15 seconds, or more.

> "I fill my lungs with air and press upward with my diaphragm to unleash a replica wolf howl"

“I have had the joy of deciphering a short howl with a clipped ending heard most often in midwinter”

When I play a recording or imitate this extended ‘long’ or ‘lost’ call, as I term it, for class participants or lecture audiences, I ask, “What does this sound feel like to you?” Respondents often say, “It sounds sad or lonesome,” and they are right. The human use of tone, timbre and intonation is similar to that of other species. Given our shared evolutionary use of sound, we humans have a reasonable starting point for understanding the intent behind animal vocalisations. The real test, however, comes from the associated behaviours we observe.

On that winter morning, the lone howler pauses for roughly 30 seconds, presumably while listening for a response, then repeats its cry. The wolf extends its howl for so long that it seems to empty its lungs completely as its voice drifts off into nothingness. In response, the pack mounts a bold, energised volley of sound with lots of yips and barking.

Back at the house, I locate the lone wolf through my telescope – it is a black-coated individual. I follow the black wolf as it traverses the corrugated snowy white landscape. It is moving westward in the direction of the now-riotous pack. The lone wolf moves at a brisk trot, then breaks into a slow gallop, pausing periodically to howl as it makes its way down from the foothills, crosses the ice of the Gardner River, and dashes across the asphalt of the park entrance road. The black wolf finishes its journey by running headlong into what is now a mosh pit of roiling, furred, yipping, howling wolves – the returned family member is being treated to a hero’s welcome.

My own efforts at reproducing the howls I hear during these and other interactions help focus my attention on details I might otherwise miss. I feel like a student at a conservatory trying their hand at a jazz standard or Bach sonata – I learn a lot more when I attempt to repeat what I hear, even if poorly. My larynx becomes the reed of a woodwind instrument, my lips and tongue function like a mute on the bell of a trombone, modulating sound in ways that help me to listen more intently to the messages the wolves are conveying.

I have had the joy of deciphering a short howl with an abruptly clipped ending heard most often in midwinter. The first time I witnessed this abbreviated call I wondered if this might be a kid that had failed howling camp. Then I learned through repeated observations and additional information from the park wolf researchers and community of amateur watchers that this is the unique sound a wolf uses to get a date when in enemy territory.

One day in a class I was teaching I imitated the bark-alarm that wolves use when in direct conflict with other wolves, (or with something else equally scary, such as humans or grizzly bears). One of the students exclaimed, “That’s exactly what the wolves do when the veterinarian shows up!”

The grey wolves at the captive wildlife facility where she worked used this particular sound to express their disdain for veterinary visits. One day she heard that same vocalisation when the animal doctor was days away from visiting. However, she was stunned to find that the veterinarian’s truck was in the parking lot well ahead of schedule – within full view of the wolf enclosure.

Though wolves are likely not a part of your neighbourhood, equally fascinating and informative ‘others’ are. Whether you live in the city or the country, wild nature is out there speaking. All of us can benefit from its lessons to forge a uniquely local and personal relationship with our planet at a time when it needs us to listen – now more than ever.

Eavesdropping on wild animals gives us a privileged glimpse into their lives, allows us to appreciate our home in magical new ways, and puts us into closer communion with nature even in urban environments. I urge you to observe and imitate. Let your childlike curiosity run riot, risk appearing silly, and you will be rewarded.

THE JOYS OF SPRINGWATCH

BBC TWO
Springwatch airs from 26th May to 12th June

As our beloved nature show celebrates its 20th birthday, anchor Chris Packham shares his favourite moments from the seasonal wildlife extravaganza

By **CHRIS PACKHAM**

CHRIS PACKHAM AND MICHAELA STRACHAN: OLI HILLYER-RILEY/BBC STUDIOS

Fellow presenter Michaela Strachan has worked with Chris before, on *The Really Wild Show*

It was spring 2013. A little afternoon sunlight was glinting through the rushes into one of the most secret spots in the world: a quarter of a square metre of marsh at RSPB Ynys-hir in Powys where, remarkably, we had a camera focused on a water rail's nest.

These are super-shy birds. They scream like pigs at night but during the daytime you won't hear a rustle. The thought of ever finding a nest, let alone getting a camera on it, was frankly absurd. But our crack team of nest-finders and camera-riggers had pulled off the impossible, and at every opportunity I was in the truck, glued to the screen. The bird was cupped in a scruffy little dish of reeds, and was fast asleep. And then she started twitching. Her eyelids flickered, she made some quiet squeaks, jerked her head a little and then became motionless again.

I couldn't move, or speak. I had just seen a water rail dreaming. Let that sink in for a moment… Even now, all these years later, I can barely believe it. But you may have seen it too, because we broadcast this most magical of moments on *Springwatch* – wow! – the UK's annual festival of wildlife.

The show is about celebrating the great and green bits of our backyards, and features the best of what's happening in all the windowboxes, gardens, parks and nature reserves nationwide. You'll see everything that creeps, crawls, slithers, stings and slimes, from the everyday and the underdogs to the perennial favourites we know and love. It's sometimes about the must-sees – those species that qualify as native exotics or rarities. It's also mine and yours and ours, and provides a sense of ownership, of connectedness, of availability. Everywhere we go, everything we see, *you* can watch it too. And the message is clear – wait for the weekend, get your boots on and get out and see it for yourself.

Yet we also show you things you would never see, even in a lifetime of wildlife-

Mandarin ducklings, ready to launch from their tree nest in 2018

ABOUT THE AUTHOR

A TV presenter and conservationist, before joining *Springwatch* Chris worked on the children's nature series *The Really Wild Show*.

What came before

Though *Springwatch* started in 2005, the series had already been evolving. In 2003 *Wild in Your Garden* started on BBC Two, presented by Bill Oddie (*above*), Kate Humble and Simon King, focusing on surburban gardens in Bristol. This was followed in 2004 by *Britain Goes Wild* with the same presenting trio. This format was developed into *Springwatch* for 2005.

A stoat causes havoc in a woodpecker’s nest at Minsmere in 2016

The feisty brown hare protecting its leverets in 2021

watching. Because even the most dedicated naturalist cannot stand stock still, invisible, in the middle of a bramble bush for 24 hours a day, for three weeks, half-a-metre from an active bird’s nest – but our tiny cameras can. We can’t see in the dark like our infra-red and thermal cameras, either, and we don’t have the eagle eyes of our massive telephoto lenses. *Springwatch* gives us an incomparable insight into the wild world outside our windows, and the little cameos of life and death that unfold are treasures beyond any dreams of a biologist.

Central to *Springwatch*’s success is the fact that the wildlife always takes centre stage – the birds and the bees are the stars of the show. The presenters are merely there to observe, consider and commentate on the behaviours our cast displays. Nonetheless, it is a show as opposed to a programme – it has to be entertaining to fully engage the audience. It’s definitely not a dispassionate lecture, and we do like our homemade props. And co-presenter Michaela Strachan and I are not opposed to a bit of banter or bickering.

Another thing at the core of *Springwatch* is our human audience and their irrepressible desire to interact via social media. The passion, joy and energy the viewers bring is uplifting, as is the breadth of knowledge they share: queries are answered, problems are solved. Occasionally, people even send in half-decent photographs… I’m half-joking, as I’m ruthlessly critical of photography, but I do recall one or two blinders.

On location, there’s a real sense of an event, too – a buzz in the air. Everyone wants to know what’s happening in the ‘X’ nest, what happened to the baby ‘Y’, who saw the ‘Z’. The commitment from every team member is 100 per cent. Everyone wants to do their utmost to make the best television in the world and get that wildlife on screen.

One of the greatest joys is the democracy – we want everyone’s knowledge and ideas. If someone turns up to make the tea and they’ve had a brainwave that we think will work, it will make it on to the show. Everyone listens to everyone, and some of the best moments over the years have come from runners and researchers.

We have become renowned for our innovative props, which are contributed by many of the team members, although a good proportion of the most inventive ones come from Lucy Lapwing. Creations range from a crossbill ‘glove’ and cardboard pine cone, to a model of a whale pooping. It’s great to see creative young people shine.

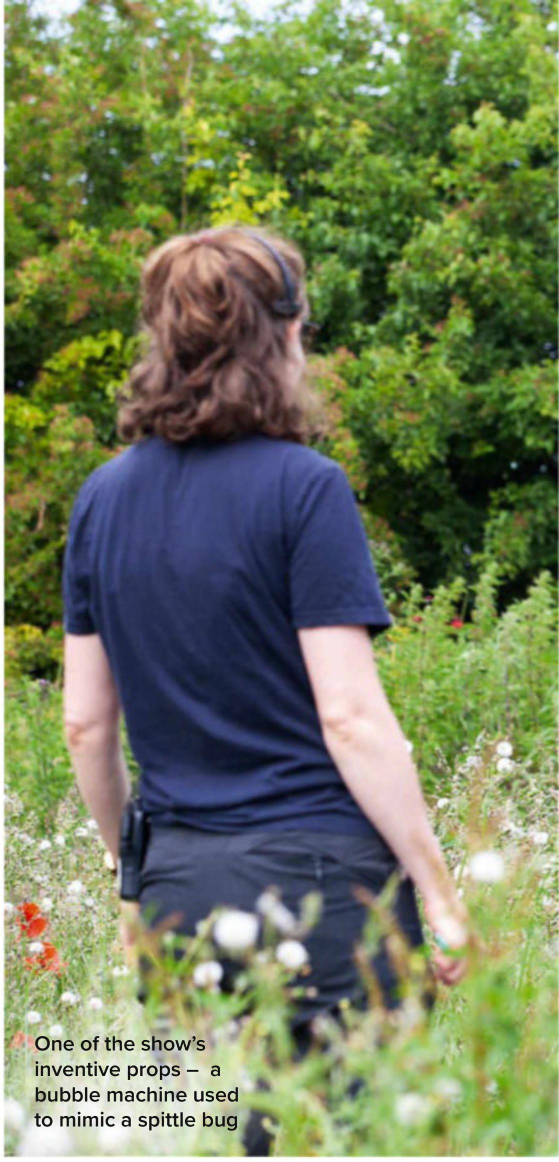
I also love that aspiring new film-makers can get their output on screen. Probably the most outstanding pure nature film we’ve ever broadcast was made by a young cameraperson called Jack Richardson. Shown in 2022, it was about the life-cycle of a lacewing. It was competent, complete, beautifully filmed and imaginative – just sublime. It is such a joy to be part of something that airs the wares of tomorrow’s top programme-makers. Brilliant!

Another thing we are all proud of is our ever-shrinking carbon footprint. When

> “The passion, joy and energy the viewers bring is uplifting, as is the breadth of knowledge they share”

MICHAELA STRACHAN: TOM GILKS; DUCKLINGS, STOAT AND HARE: BBC NATURAL HISTORY UNIT; BILL ODDIE: ROB COUSINS/BBC PHOTO ARCHIVE

Technologies that support the live broadcast are much changed since the early days



One of the show's inventive props – a bubble machine used to mimic a spittle bug

> "We are keen to impress on viewers that now is the time for action"

I started on the show back in 2009, recycling was lacklustre, there was little plant-based food, and the entire production was powered by diesel generators. Today, thanks to the drive, determination and ambitions of the team, we are leading the world in getting live broadcasting towards net zero. Fossil-fuel power is long gone. We now run on green hydrogen, and our only emission is slightly weird-tasting pure water. There are no problems, just progress – and it's high time all productions did the same. Sport events, music festivals and live news productions all need to get their acts in order and follow our lead.

This year we will also be moving towards plant-based catering – saving our world one mouthful at a time. We're not paperless yet, though – well, I almost am as my script is on my phone but I still have a few paper programme cards.

Over the years, little has gone wrong on *Springwatch*. The weather, of course, is unpredictable but our equipment rarely fails. The main issues we face are content-related. There are those of us who feel that we are there to entirely impartially report on the reality of nature, so we should show the viewers exactly what happens: when a predator kills and consumes one of our 'cast', that's what we should transmit – however gruesome it may be. But there are also those who feel that we should sanitise it, cool it down, remove the gory bits. There are fierce debates, but normally we find a compromise to satisfy both 'Team Reality' and 'Team Sentimental' (as I call them).

The use of music also divides the fans. We have 'natural sounds only' shows, so just commentary and the sounds of nature. The Mindfulness Moments, the 90-second, slowed-down snapshots, are music *and* word free. I find these a bit Marmite. I like some of them.

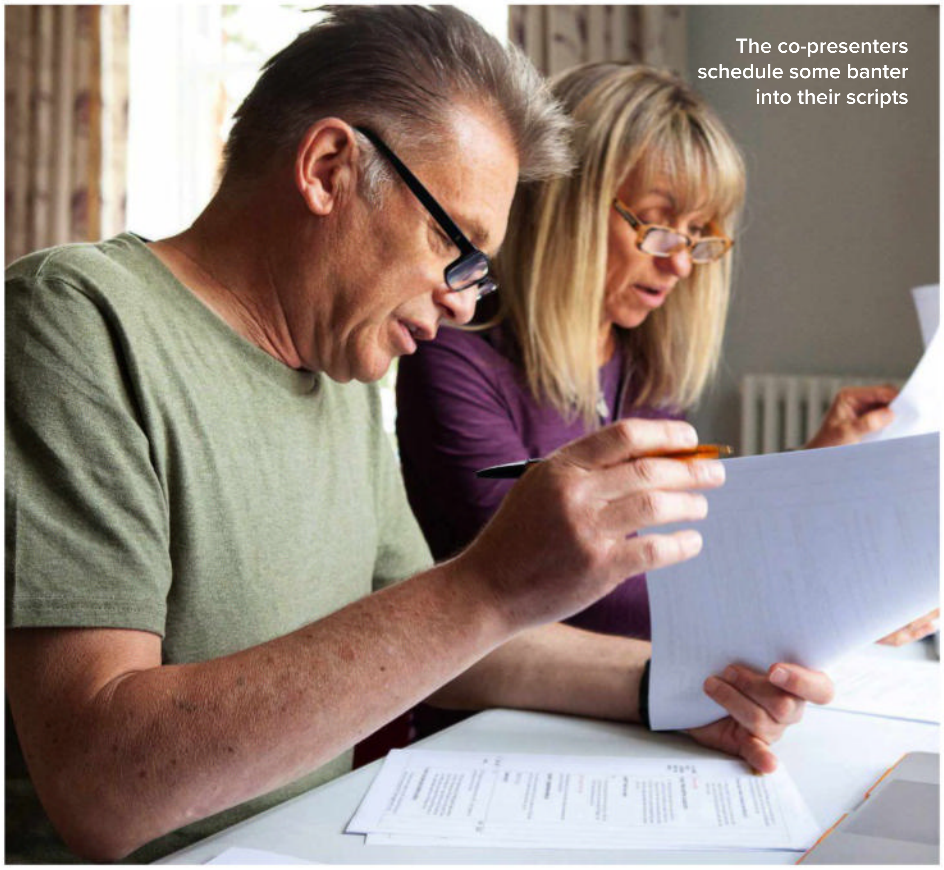
In the 20 years we've been spreading the season's joy on screen, there have been many changes. Technically, cameras have got smaller, cheaper and better quality. Images are sharper, opportunities to stick our noses into nature more broad. Outside of television, rapidly developing technology has allowed us to learn a lot more, a lot more quickly, about our wildlife. But this is double-edged sword.

New scientific discoveries are extraordinary but the declines are heart-breaking as we witness the catastrophic effects of climate breakdown on top of decades of development, the intensification of agriculture and direct persecution of our wildlife. Last year was the worst year on record for butterflies and bumblebees and, while it is not in the programme's remit to campaign, we are keen to impress on our viewers that now is time for action if we want to preserve our precious wildlife. What might *Springwatch* 2035 or 2045 look like? I'm scared to give an honest answer.

When you've been doing a show for years but you still love it as much as the day you started, it's hard to pick out favourite moments, as you're always looking forward to the next one, and nothing is as exciting as the unknown. But I'll try...

Perhaps the long shot of a marsh harrier hanging over an animated brown hare furiously punching the air in a desperate attempt to protect her leverets at Wild Ken Hill (2021). There was also the beautiful underwater shot of a dipper submerged in a gin-clear icy Speyside stream, all silvery beneath the surface (2018). The parachuting mandarin ducklings floating down to earth from their 'too high' nest with a fluffy bump at Sherborne Park (2018) were awesome as well. As was the stoat who scaled a tree to reach the nest of green woodpecker chicks at Minsmere (2016) – it must have been like a Terminator in a telephone box in there. Luckily we could only *hear* the carnage.

If I really had to choose a rival to that slumbering water rail, it would be the delicate backlit ballet performed by a cranefly dancing on the glistening surface of a river in the 2019 show. This single shot of something so commonplace, so simple, was consummately beautiful and perfectly encapsulated the whole purpose of our programmes – engendering a love of life, all life, however ordinary it might appear.



The co-presenters schedule some banter into their scripts

LOOKING BACK

The changing faces of *Springwatch*

2005 *Springwatch* starts, with Bill Oddie, Kate Humble and Simon King presenting, live from the Fishleigh Estate in Devon.

2008 Broadcasting moves to Pensthorpe in Norfolk. *Autumnwatch* starts.

2009 Chris Packham replaces Bill Oddie.

2011 Live broadcasting moves to RSPB Ynys-hir, Powys. Martin Hughes-Games replaces Simon King.

2012 Michaela Strachan replaces Kate Humble. *Winterwatch* begins.

2014 Live broadcasting moves to RSPB Minsmere, Suffolk.

2017 Broadcasting moves to the National Trust's Sherborne Park Estate. Gillian Burke joins the team.

2018 Martin Hughes-Games is replaced by guest presenters, incuding Steve Backshall.

2019 Live broadcasting moves to the Cairngorms. Iolo Williams joins as a presenter.

2020 During lockdown the presenters report from their homes. Megan McCubbin joins.

2021 Live broadcasting moves to Wild Ken Hill, Norfolk.

2022 The last *Autumnwatch* airs.

2023 Broadcasting moves to RSPB Arne, Dorset.

2025 The new series is broadcast from Longshaw Estate in the Peak District and Northern Ireland.

CONTROL ROOM, BUBBLES, AND CHRIS PACKHAM AND MICHAELA STRACHAN: TOM GILKS;
THREE PRESENTERS: JON HALL/BBC PHOTO ARCHIVE

Holding a fawn within handfuls of grass prevents the transfer of human scent, so a mother won't abandon her baby

HELPING HANDS

Every year in Germany, thousands of fawns perish during hay-making season. Now volunteers are using technology to rescue them

Words by **JOE PONTIN** *Photos by* **VIKTORIA PEZZEI**

IT’S DAWN IN A MEADOW IN southern Bavaria. A faint breeze ruffles the grass and whispers through the leaves of the woodland nearby. It seems deserted. Yet look closely – there, in the shadow between blades of grass, two glossy brown eyes glitter. Curled unseen in its green den lies a tiny roe deer, with black nose, outsized ears and fur dappled with spots.

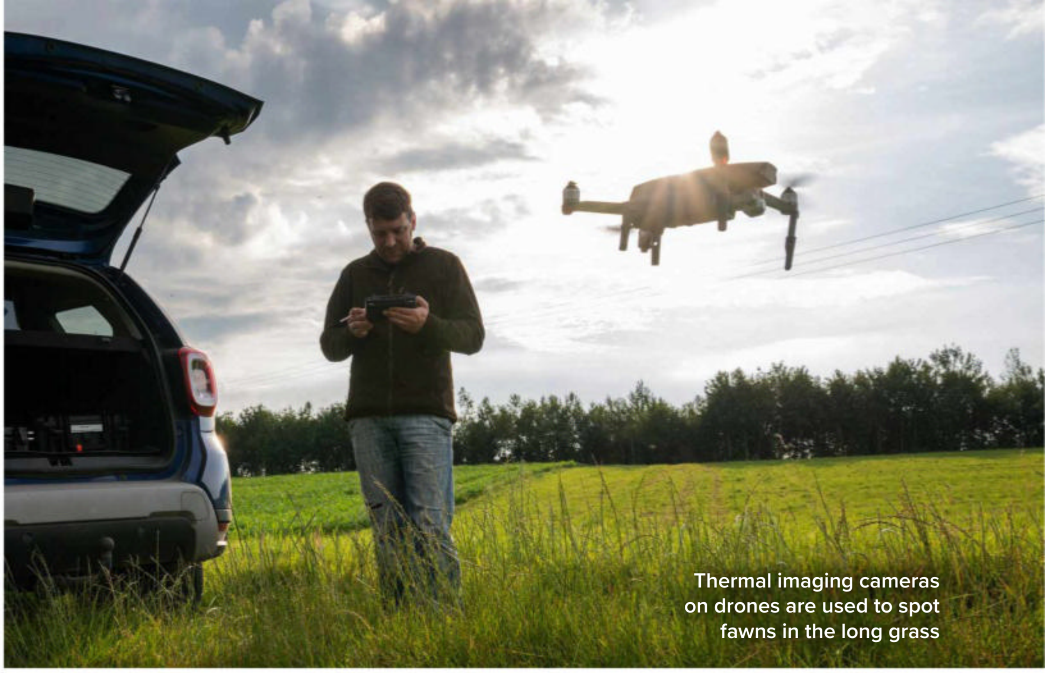
Not far away, farmer Klaus Waldschütz is busy attaching his mower to his tractor. It’s hay season, and the weather is fine and dry – perfect for haymaking. Klaus has 6ha of grassland and meadow to cut, dry out, rake and bale. It will be a long few days, but the hay crop is vital nourishment for the farm’s dairy herd through the winter months.

With a dry weather window this morning, farmers all over Bavaria are preparing their hay mowers. These are impressive pieces of kit containing whirling knives that swiftly reduce the knee-high grass down to a few centimetres.

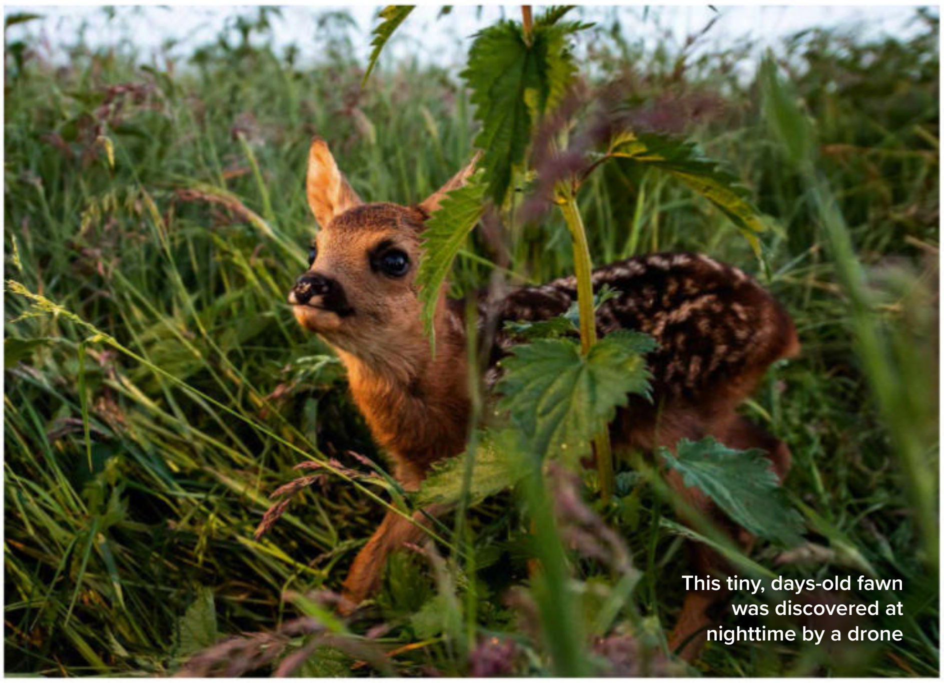
ABOUT THE AUTHOR

Joe is a freelance editor and writer, and was the managing editor of *BBC Countryfile Magazine*. He loves spending time in the woods and hills near where he lives.

A tractor on Klaus Waldschütz's farm cuts a swathe through a meadow



Thermal imaging cameras on drones are used to spot fawns in the long grass



This tiny, days-old fawn was discovered at nighttime by a drone

Evolution has not prepared the fawns for such behemoths. The loss of life is staggering: in Germany alone, between 50,000 and 100,000 deer are thought to perish beneath the blades of hay mowers each year, according to Deutsche Wildtier Stiftung (German Wildlife Foundation). Such collisions trouble farmers. Klaus remembers when his father accidentally killed a youngster during mowing. "It was after a long period of rain. The grass was pressed down, so he didn't notice the deer. He felt bad because a living creature was harmed. A farmer works with nature and its animals."

Why don't fawns simply run from the mowers? The answer is rooted in the ingenious strategy roe deer have evolved to protect their newborns from predators, a strategy that has served the species well – until relatively recently.

Klaus's farm lies 50km south of Munich in the foothills of the Alps, amid rolling grassland and forest – perfect roe deer country. While primarily woodland creatures, roe deer often stray on to farmland, both to graze and to give birth. In long grass, the doe can more easily hide her fawns from predators. In this part of Bavaria, Mangfalltal, these include foxes, badgers and an occasional golden jackal.

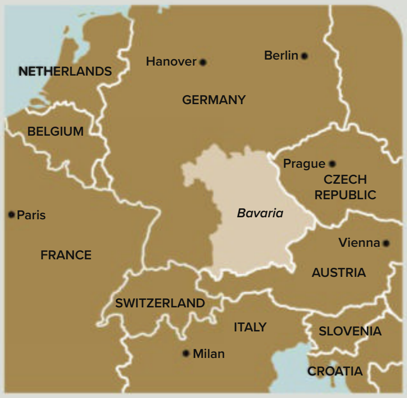
Newborn fawns are small and frail – it takes time for their legs to become strong enough to carry them far. For their first few days, a youngster remains where it was born,

ABOUT THE PHOTOGRAPHER

Viktoria is a German/Ukrainian photojournalist who specialises in capturing the often-complex relationship between humankind and wildlife. Find out more at viktoriapezzei.com.

DEER: DPA PICTURE ALLIANCE/ALAMY

Where is Bavaria?



Bavaria, officially the Free State of Bavaria, sits in the south-east corner of Germany. Lush alpine meadows, dense forests, mountains and lakes abound in an area much loved by nature devotees.

Volunteers for a deer rescue group use an app linked to a drone to find a fawn

> "German animal welfare laws require farmers to take reasonable precautions to protect wild animals"

gathering strength as it is slowly fortified by its mother's milk. If twins are born, which is not unusual, the doe separates them as soon as they are strong enough to move, to maximise the chances of at least one surviving a predator attack.

The doe must also feed. If she stays close to her baby she will lure predators, so the safest course is to graze some distance away, foraging for grass, leaves and ferns. Every two or three hours, once her udder is full, she returns to feed her fawn. With its mother away, the fawn's only defence is to stay hidden, as it cannot outrun its predators. For the first week or two of its life, it obeys an innate instinct in the presence of threat: lie low and stay silent, no matter how close that threat comes.

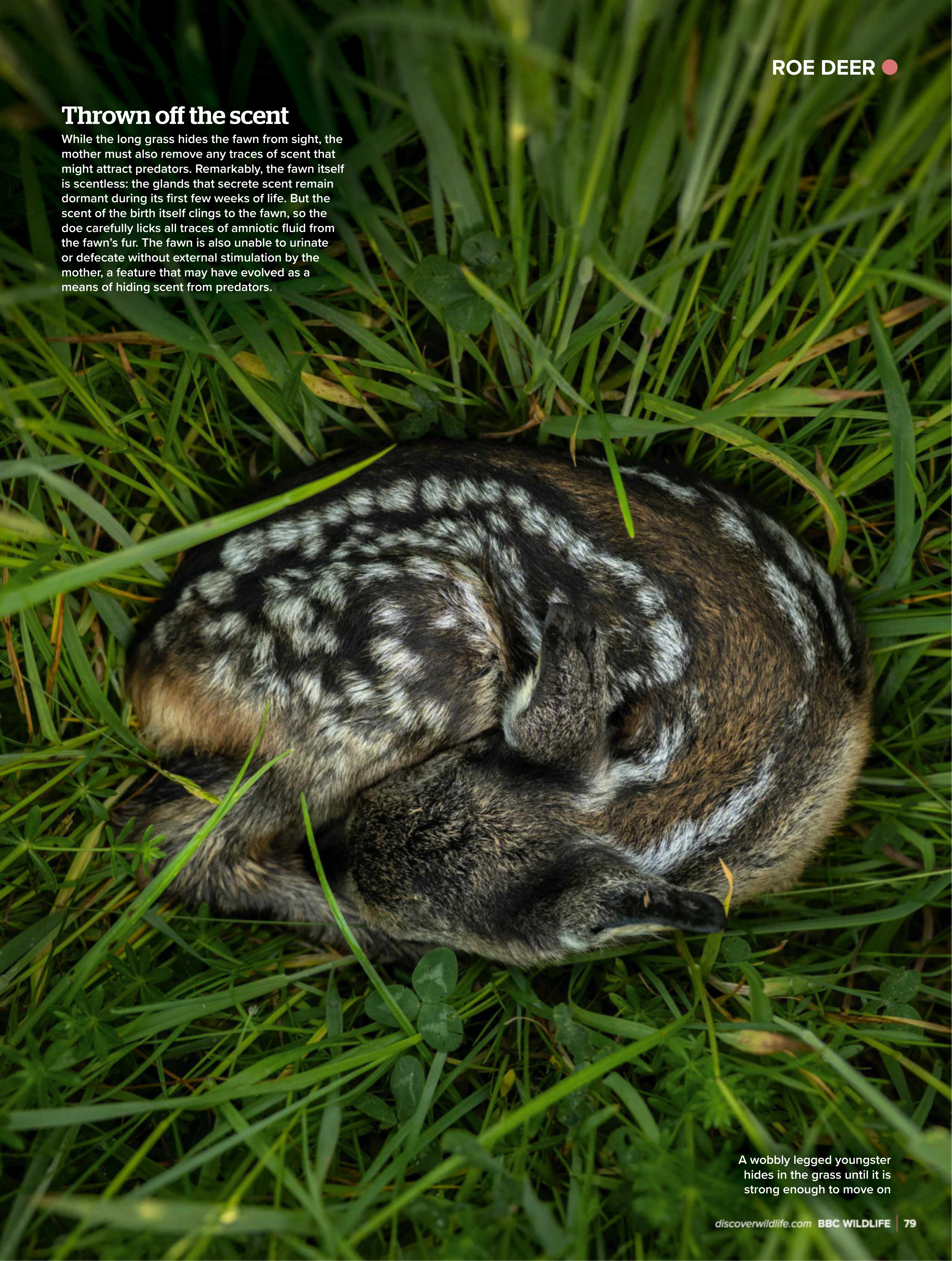
If you are wondering why farmers don't simply check their fields for fawns before mowing, well, they do – and not only out of compassion. German animal welfare laws require farmers to take reasonable precautions to protect wild animals. Farmers also have obligations to deer and other game animals under the Reviersystem, which governs hunting rights. If a deer dies on their land, they may have to compensate the district's holder of hunting rights. Farmers are also keen to keep their hay free of animal remains, which may poison their cattle. Partly for these reasons, most farmers walk the hay meadows, often with dogs, to drive deer out before mowing, or ask their local hunters to do so. Unfortunately, despite these inspections, fawns are so well concealed that many lie undiscovered.

Found fawns are sheltered under a basket until the immediate area is mown

If these young deer are to be rescued in significant numbers, something much more effective is required – something that can see through the grass to the unmoving fawn beneath. Happily, technology now offers a way to do just that.

THE FAWN BLINKS AT THE morning sky above, inhales the scent of grass and listens to the faint sounds of the meadow – the bass tones of distant cattle lowing, the song of a skylark, the buzz of bees. Then she catches a strange new sound, something like the whine of hornets. Fortunately for the fawn, the whining sound is a friend not a foe: a drone fitted with a thermal-imaging camera.

In 2020, the growing availability of drones inspired an unusual coalition of animal rights campaigners and hunters to set up Rehkitzrettung ('Deer Rescue') Mangfalltal. The team now has five drones and is supported by the German agriculture ministry,

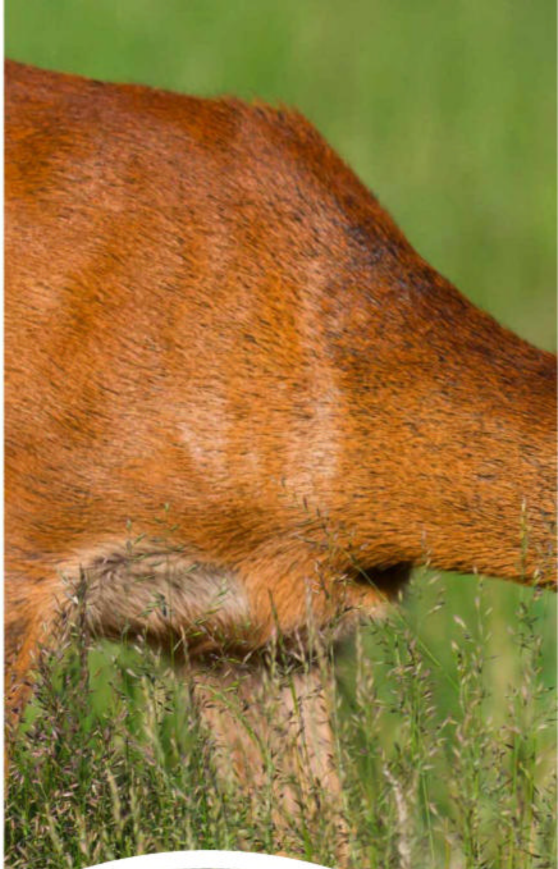


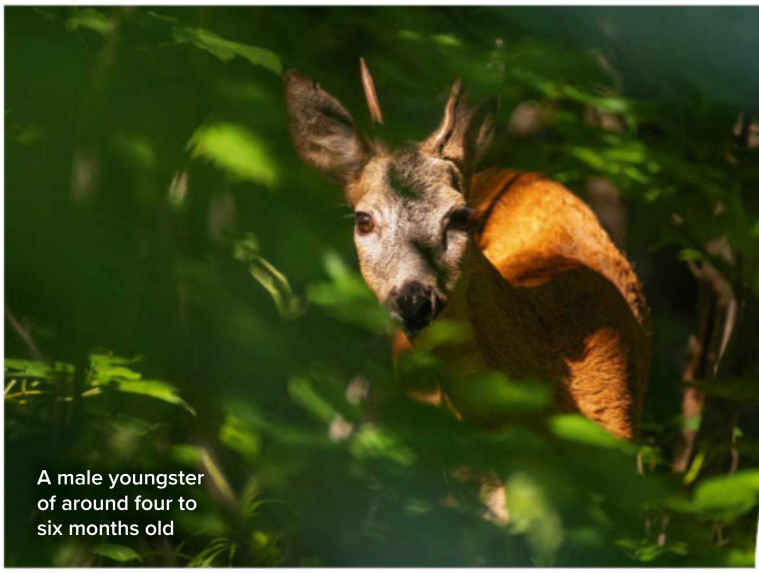
Thrown off the scent

While the long grass hides the fawn from sight, the mother must also remove any traces of scent that might attract predators. Remarkably, the fawn itself is scentless: the glands that secrete scent remain dormant during its first few weeks of life. But the scent of the birth itself clings to the fawn, so the doe carefully licks all traces of amniotic fluid from the fawn's fur. The fawn is also unable to urinate or defecate without external stimulation by the mother, a feature that may have evolved as a means of hiding scent from predators.

A wobbly legged youngster hides in the grass until it is strong enough to move on

Using the latest technology to find fawns in the grass





A male youngster of around four to six months old

It's safe to release this little one back into its habitat

which funds two-thirds of their cost – up to €4,000 (around £3,400). There are 12 volunteer drone pilots and 45 active members that assist with rescues. The drone teams set off before dawn, while the rescue teams follow a couple of hours later.

A self-confessed tech geek, Tim Rau joined the deer rescuers two years ago, after a neighbour – an elderly farmer – accidentally killed a fawn during mowing. He has assisted with rescues but this morning Tim finds himself standing at the edge of the field, staring at a black control box in his hands. A few metres away, a small drone rises slowly from its landing pad and sets off on its mission to survey the field.

Tim's work has been made easier by one key supporter of the deer rescuers: Martin Israel, who moved to the area in 2020. An advisor to the group since 2021, Martin says he was the first person to mount a thermal camera on a drone to rescue fawns, back in 2010, while studying for his doctorate in the subject.

According to Martin, many rescue groups don't use drones efficiently. The pilots, he explains, tend to watch the live view of the thermal camera on the monitor and, on finding a hot spot, stop the drone and send in the rescuers. "This takes time and the drone has to wait in the air, emptying the battery," he says.

Martin claims his method is five times faster. The drone flies around the field, recording a geolocated image every second. The images are then downloaded to an app, developed by Martin. Tim looks for objects emitting heat, which show up in thermal images as light, warm colours (colder objects are rendered in dark, cool hues). "The thermal signature of a baby deer is very distinctive," says Tim. A hare or a cat is of similar size but "you can definitely recognise the difference".

When the image reveals one or more hidden fawns, the drone pilot takes the GPS coordinates, shares them with the rescue team, and moves on to the next field. Now it's the turn of the rescue team: they must find the fawn and carefully remove it from the field. There are two people in each team: one carries a basket and the other a pole.

"You trust the GPS coordinates," says Tim. "If you can't see the fawn, you put the pole in the ground as a marker and search a 5m radius around it. You are full of anxiety – can you find it? Can you grab it?"

Once located, the youngest fawns, who have the strongest instinct to freeze, are the

The doe encourages the fawn to start using its legs and move

DOE AND FAWN: MINDEN PICTURES/ALAMY

“The sheer number of lives saved encourages the deer rescuers to keep going”

easiest to pick up. Rescuers wear new gloves each season – if strange scents transfer to a youngster, its mother may disown it. They’ll often take a handful of grass in each hand before picking up the fawn, too, to avoid directly transferring their scent to it.

“The fawns are always lighter than you think, and gangly – their legs are very thin,” says Tim. “They look at you with their big eyes. They are usually stressed – you can feel them breathing fast, and their heartbeat.”

LATER IN THE SEASON, WHEN THE fawns start losing the instinct to freeze, picking them up becomes trickier. “They will run for it but you can grab them if you’re quick,” says Tim. The slightly older deer tend to struggle more and cry out “like an eagle call, a high whistle”.

Any distress is brief. The rescuers carry their quarry to a nearby woodland edge, gently placing a basket over it to keep it safe while the hay mower cuts the field. It will rarely be moved more than 10m from where it was found, so when the time comes to release it – ideally within two hours – the mother has no difficulty in finding it again.

“The moment you release a fawn back into nature, that’s super nice,” says Tim. “Silently, you lift the basket. If it’s very young it will lie there until you move away, and then it cries for its mother. If it’s a bit older, it runs away into the woods and then calls out. But in either case, you know the doe will be along soon.”

The haymaking season may only last for two months but there is a lot of ground to cover. Last year, Deer Rescue Mangfalltal searched 650 fields, a total of 2,000ha. It can be hard work for the volunteers but it’s rewarding. “You’re up at 3am and then comes your day job. But it’s all worth it,” says Tim. And, of course, the sheer number of lives saved encourages the deer rescuers to keep going. On the peak day in the 2024 season, the team saved 45 fawns.

While drone use is more expensive than searching with a dog, it is nevertheless growing, says Martin Israel. With government support helping to fund 2,446 drones since 2021, plus a similar number of privately owned drones, he says there are now enough to mount deer rescues in up to 40 per cent of Germany’s grasslands.

Farmer Klaus Waldschütz is one satisfied customer. “I’ve been doing this for a few years already,” he says, “and I would recommend it to my fellow farmers.”

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Do we really know more about space than the ocean?

Well, not quite – but it's true that about 80 per cent of our ocean floor remains unexplored and uncharted. Discovering what our ocean depths look like and what life might be found there is just as challenging as learning about the universe. Our undersea world is very cold and lacking light, and therefore visibility. Water pressures impose a crushing weight on delicate equipment. Using exploration vessels is difficult, costly and off-putting to all but a dedicated few.

Above our heads, extreme cold, vast distances and a lack of breathable atmosphere also require costly specialist machinery, but the difference is that space exploration is a prestige endeavour that generates much news coverage and publicity for those taking part.

It's hard to estimate global spend but the USA can serve as an illustration. The National Oceanic and Atmospheric Administration allocated $77 million to ocean research in 2021. In the same year the National Aeronautics and Space Administration received $34 billion.

So we know a reasonable amount about our solar system and a little bit about what lies beyond. At least we know how much we don't know about our oceans, and every piece of knowledge gained gets us closer to knowing everything. **Sheena Harvey**

We know plenty about fish such as tarpon, which live relatively close to the surface

TARPON: EXTREME-PHOTOGRAPHER/ISTOCK

CHIMP CHAT
How do chimpanzees communicate and can they 'talk' with their hands? **p84**

SEAL DIVING
How do seals know how long they can spend underwater without drowning? **p86**

THE HEAT IS ON
Which animals can survive the highest temperatures and how do they manage it? **p88**

Chimps grooming each other in Kibale National Park in Uganda

Do chimps 'talk' with their hands?

About 50 years ago, researchers Beatrix and Alan Gardner taught a young female chimp called Washoe how to sign using American sign language. They raised her like one of their own. They dressed her, played with her, ate at the table with her and took her for rides in the family car. They communicated exclusively with her in sign language and, pretty quickly, Washoe began to sign back.

By the time she was five, she had learned about 350 signs. Her fingers were dextrous and fast, and often she would combine signs together to make new meanings. When she saw a swan for the first time, Washoe made the signs for 'water' and 'bird'.

Similar projects followed, with mixed results. When chimps were treated less like family, and more like test subjects, they did less well. Chimps, it turns out, need a stable family environment if they are to learn to communicate well – just as we do. Then the researchers moved on and many of the chimps were rehomed in sanctuaries, where things took a turn for the worse. After spending so much time with their human teachers, the apes found it hard to adjust to living with their own kind. Washoe signed her displeasure. She referred to her new chimp neighbours as 'black bugs'.

> "These chimps are gesturing all day, every day"

It was an ethically challenged time for chimpanzee research. While the experiments showed that chimps are smart and can grasp some of the basics of human language, it was all desperately artificial. So, researchers moved on to studying how the animals communicate naturally in the wild. Primatologist Cat Hobaiter, from the University of St Andrews, has been studying communication in chimps for more than 15 years, predominantly in Uganda. Chimps communicate with each other vocally, via hoots, grunts and other sounds, but they also communicate with gestures.

"From a young alpha male to a 60-year-old grandma, these animals are gesturing all day, every day," says Hobaiter. "There's a constant back and forth between individuals. It's how they run their lives."

By watching the chimps carefully, and studying the responses that specific gestures elicit, Hobaiter has been able to work out what many of them mean. An arm extended with an upturned palm means 'give me that'. A shoeing away gesture means ‘back off’. A long slow scratch, meanwhile, can have different meanings depending on the context. It can mean ‘groom me’ or ‘I’ll groom you’, but it can also mean ‘let’s travel’.

To date, Hobaiter has discerned about 150 different gestures, made with the animals’ hands and bodies, that she has catalogued as part of a project called The Great Ape Dictionary. Most of these gestures are common to other apes, such as bonobos and gorillas, and within chimps, there are regional differences – the chimp equivalent of having different dialects or accents.

> **“It’s the closest thing any non-human has to language”**

A far cry from the human-determined signs that chimps were taught in lab experiments, chimp gesture has evolved in the wild to convey the sorts of things that are meaningful and important to them.

And it turns out that what we tend to do with language, they tend to do with gesture, and vice versa. Humans, for example, use speech to make arrangements and body language to add emphasis. Chimps are more likely to gesture ‘come here’ and ‘give me that’, but vocalise to convey emphasis or tone. Screams can be used to indicate alarm, while ‘pant hoots’ (a series of ‘hoos’ and pants that build into a scream) tend to be a sign of excitement.

Indeed, chimp gesture is the closest thing that these primates – and perhaps any non-human animal – have to language. They do ‘talk’ with their hands, all the time. It’s not language but it does contain units of information that have meaning, and that are communicated deliberately to other animals with intent.

Chimp gesture is a system that is full of richness and subtleties that we are only just beginning to understand. For chimps, it’s about as perfect a communication system as you can get. **Helen Pilcher**

About 150 chimp gestures have been identified

A researcher at the Chimpanzee and Human Communication Institute, Washington, USA, 1993

CHIMPANZEES GROOMING: WORLDFOTO/ALAMY; YOUNG CHIMPANZEE: FIONA ROGERS/GETTY; RESEARCHER: ASSOCIATED PRESS/ALAMY

Q&A

Grey seals spend most of their time out at sea feeding on fish

A male Hawaiian monk seal goes underwater

Why don’t seals drown?

Human freedivers can descend to significant depths on just one lungful of air. To do this they massively overbreathe beforehand to clear their systems of as much carbon dioxide (CO_2) as possible. This is the gas that triggers the normal urge to breathe when we hold our breath. But the technique doesn’t always work. Freedivers can black out underwater and must have teams of scuba divers on standby to rush them back to the surface.

> “Seals can dive to great depths for long periods”

Seals can dive to great depths for long periods of time, chasing their fishy prey. So why do they never seem to end up unconscious? This question intrigued marine ecologist Chris McKnight and his colleagues at the University of St Andrews.

To find out, they lined up six grey seals, temporarily taken from the wild, in a specially built tank. This was an enclosed underwater home with a feeding area and a domed breathing chamber at one end. The seals could forage for as long as they liked in the water and then surface to take a breath in the chamber, rather like emerging into the air through a hole in an ice sheet.

The scientists filled the breathing chamber air with different combinations of oxygen and CO_2, starting with normal air at 21 per cent oxygen and 0.04 per cent CO_2. Gradually they switched to higher concentrations of oxygen and then lower, followed by higher and lower concentrations of CO_2. They measured how long the seals’ feeding trips lasted while breathing each of the air mixes.

The expectation was that high-oxygen air would mean the seals stayed underwater longer. High CO_2 levels should make the dives shorter, they thought, as with humans when high CO_2 levels in their blood activate the need to breathe. To their surprise, the amount of CO_2 had no effect on the length of time the seals took between breaths. But low oxygen levels certainly did.

Their conclusion was that a seal’s brain monitors the amount of oxygen in its blood, rather than the levels of CO_2, and the animals make their own decisions on how long to stay underwater based on that information. Instead of their bodies being governed by an involuntary reaction to the amount of CO_2 in their systems, seals can judge when their oxygen levels need topping up and make their way to the surface in a controlled and timely manner. Therefore, they never risk drowning. **Sheena Harvey**

GREY SEAL: ALEX MUSTARD/NATUREPL.COM; HAWAIIAN MONK SEAL: DOUG PERRINE/ALAMY

Do insects fart?

Many of our fellow creatures can let rip – including some insects. Let's start with the basics. Farting requires a bottom. Almost all insects possess an anus, so pass this first test with flying colours. However, to break wind, they must also be able to produce hefty amounts of gas in their gut during the digestion process. Most insects don't, but several kinds of insect excel at it. The champion farters are species with very high-fibre diets, such as wood and fungus-munching termites and cockroaches that break down rotting organic matter. These insects generate lots of digestive gas, including methane. And it has to go somewhere.

Insect farts are silent – as you might expect, given the size of these animals. Their 'bottom burps' don't really smell, either. However, there are a few insects that can release pretty vile emissions when they want to. For example, the carnivorous larvae of some beaded lacewings, which live inside termite nests and feed on the unfortunate termites, subdue their victims by aiming a foul cloud of intoxicants at them. As Nick Caruso and Dani Rabaiotti point out in their book *Does It Fart?*, you could say that the lacewing larvae fart their prey to death.

Ben Hoare

As adults, beaded lacewings appear harmless – but beware the toxic emissions of their larvae

Beaded lacewing larvae prey on termites in their nests

BEADED LACEWING: JOHN ABBOTT/NATUREPL.COM (CONTROLLED CONDITIONS); TERMITE MOUND: VICKI JAURON, BABYLON AND BEYOND PHOTOGRAPHY/GETTY

Q&A

Camels in the Sahara desert in Algeria. They are especially suited to extremely hot conditions

Which animals live in the hottest temperatures?

PLENTY OF ANIMALS CAN HANDLE extreme heat and, for obvious reasons, they tend to live in the tropics, often in deserts. Camels, for instance, can cope with temperatures of up to 49°C, thanks largely to their humps, where lots of their fat is stored. These allow them to lose body heat rapidly and efficiently. In addition, their densely furred coats and leathery foot-pads insulate them from the scorching midday heat. As a last resort, they sweat to cool down, though seldom need to.

Desert animals (camels included) also have a range of adaptations to reduce how much water they lose, so can endure remarkably long periods without taking on fresh supplies. Reptiles are brilliant at it, which explains why deserts are home to an impressive variety of snakes and lizards. Australian lizards called thorny devils can actually absorb water directly through their skin. Reptiles can also bury themselves in the desert sand and enter a hibernation-like state known as torpor, during which they slow their metabolism right down, to make it through the toughest conditions. Africa's golden moles do this, too.

> “Camels can cope with temperatures of up to 49°C”

Many other desert animals rely on behavioural strategies to survive the blistering heat. They might, like the mice-like jerboas for example, dig burrows to shelter from the sun and then emerge at night when the air is somewhat cooler.

But among desert dwellers, ants are truly exceptional in their ability to take extreme heat in their stride. Two closely related species, the Sahara silver ant and Sahara desert ant, are known to survive when their body temperature hits an amazing 53°C, albeit for a short time. As far as we know, no land animal can brave that sort of heat indefinitely.

When it comes to heat tolerance, however, the planetary record-holder never sets foot on land: it's a deep-sea worm. Discovered in the early 1980s, the Pompeii worm inhabits hydrothermal vents on the deep ocean floor, where the water is superheated to around 80°C. A thick layer of bacteria encases the worm's body and acts as fleecy protection.

One other group of animals can beat even this performance – though not while still active. Tardigrades, or water bears, are tiny creatures that shrivel into minuscule balls called tuns when the going gets tough. In this strange resting, immobile state, the tuns are able to withstand temperatures as high as 149°C. Unscathed, the tuns rehydrate into tardigrades when things improve. **Ben Hoare**

CAMELS: CTK/ALAMY

Which animal has the longest tail?

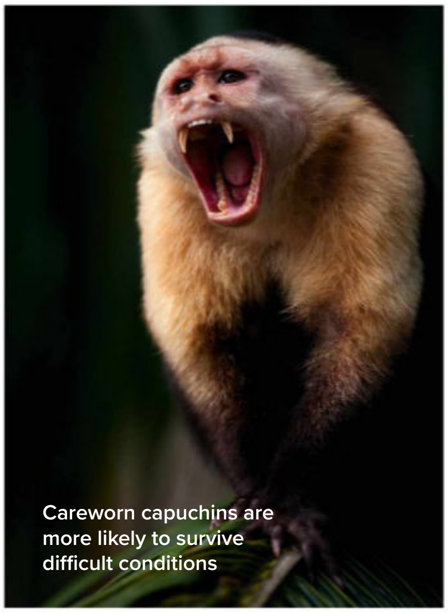
Strictly speaking, the tail-like structures found in everything from scorpions to mayflies are not true tails. Only vertebrates – animals with a spine – are genuine tail-owners. And among vertebrates, tails are really common. In fact, we humans usually develop one too, then lose it while still an embryo. All that's left is the tail bone, or coccyx, at the end of our spine.

Tails come in pretty handy. So much so that many vertebrates use them rather like an extra hand. They can be held out for balance, thrust side to side to swim, wagged or waved to send messages, and deployed as fly whisks, rudders, drumsticks or whips.

The longest true tail belongs to the common thresher shark. Its amazing tail has a scythe-shaped upper lobe that may be as long as its body, and in some big individuals is thought to reach 3m in length. There are three species of thresher shark, all of which wield their extraordinary tail to herd and stun their fish and squid prey. Often, thresher sharks will hunt as a group, circling around a shoal of fish to make them bunch up, before powering in to tail-slap their prey and swallow their stunned victims whole. **Ben Hoare**

Thresher sharks' tails can reach up to 3m long and are used for stunning prey

Do animals get stressed?



Careworn capuchins are more likely to survive difficult conditions

We often think of stress as a bad thing, but it has evolved to protect us. When we find ourselves in life-threatening situations, our bodies prepare to fight or run. Stress hormones are released, our heart rate increases, our breathing quickens and our muscles become primed for action.

Every species on Earth has some form of stress response, from bacteria to plants, invertebrates and vertebrates. When faced with, for instance, being eaten, extreme weather or competition from rivals, the stress response kicks in and prepares individuals to get through the situation alive.

The behaviour that stress causes varies drastically between species, though. For example, while humans might run from a predator, opossums play dead and ooze a stinky liquid from their rear ends, horned lizards shoot blood from their eyes, and some plants create toxins so that they taste nasty.

Just as some people are more prone to stress than others, the same is true in animals. From fish to primates, individuals vary in how stressed they become. In some species, such as the white-faced capuchin, scientists have even shown that individuals who get more stressed are more likely to survive tough conditions. Stress really can be a good thing. **Beki Hooper**

THRESHER SHARK: JONAS GRUHLKE/ALAMY; WHITE-FACED CAPUCHIN: MAMMALS OF PANAMA BY OYVIND MARTINSEN/ALAMY

The prominent whiskered area on the walrus's face is called a moustache

ALL YOU EVER NEEDED TO KNOW ABOUT

Walruses

BY JO PRICE

WALRUSES LIVE IN THE ARCTIC and sub-Arctic. They are one of the largest pinnipeds (meaning fin-footed) and are related to seals and sealions. Their Latin name, *Odobenus rosmarus*, translates as 'tooth-walking seahorse' and refers to their most distinguishable feature – large tusks.

What do they eat?

These marine mammals feed in shallow, coastal areas and usually only embark on short dives. Foraging trips can last from a few hours to several days. They mostly prey on bivalve molluscs, which they search for in soft sediment, using their super-sensitive whiskers. Walruses also eat worms, snails, crabs, amphipods, shrimps, sea cucumbers, tunicates and slow-moving fish.

Where do they live?

These pinnipeds are extant in Canada, Greenland, Russia, Svalbard and Jan Mayen, and Alaska in the USA. The species is documented as 'presence uncertain and vagrant' in Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Japan, Netherlands, Norway, Spain, Sweden and the UK, and Maine and Massachusetts in the USA. There have been several sightings of the species appearing outside of its usual range in recent years, particularly in Europe.

What habitat do they need?

In addition to shallow waters, walruses need access to open water to forage, and rely on haul-out spots close to feeding areas. Their preferred haul-out platform is sea ice, but walruses do use sites on land in the summer and autumn. On land walruses rest between foraging trips, breed, give birth, nurse their young, and shelter from rough seas and predatory polar bears and killer whales.

Are walruses social animals?

Walruses are gregarious and tend to gather in large groups when out of the water. At sea, they usually travel together too. They're sensitive to disturbance and noise, and at mass gatherings stampedes can occur if they're frightened. This can be caused by human disturbance, low-flying aircraft and near-shore vessels. Outside of the breeding season, males are often found in areas away from females and their calves.

What subspecies of walrus are there?

There are two subspecies of walrus: the Atlantic walrus (*Odobenus rosmarus rosmarus*) and the Pacific walrus (*Odobenus rosmarus divergens*). According to the IUCN, the Atlantic walrus occurs from the eastern Canadian Arctic to the western Kara Sea. The Pacific walrus normally ranges from the Bering and Chukchi Seas, which constitute the centre of its range, to the Laptev Sea in the west and the Beaufort Sea in the east.

How big are walruses?

Pacific walrus males can reach 3.6m in length and weigh 880–1,557kg. Adult females

Walruses are very social, resting closely together in large herds

Top: The larger the tusk size, the more elevated the social standing of the walrus
Above: A cow protectively cuddles her young

are about 3m and weigh 580–1,039kg. Atlantic walrus adults are shorter and lighter.

How do they keep warm?

Thick layers of fat under the skin insulate them so they can cope with temperatures as low as -35°C.

Why do they turn pink?

Walruses are brown but can turn white after diving in icy water for long periods, or even pink when they are warm (to diffuse excess body heat) – an inherent ability to vary the blood supply to the surface of their bodies.

What is special about their throats?

Specialised air sacs in the throat are known as pharyngeal pouches and can be inflated with air, allowing walruses to float upright in the water and amplify vocalisations.

How do walruses breed?

Courtship and mating occurs in the winter. Calves are usually born the following May, with one calf produced every three years. During this season mature males exhibit aggressive behaviour such as vocalisations, tusk wielding and confrontation as they fight for dominance and access to females.

Why do they have tusks?

Tusks on males and females grow up to 1m long and weigh 5kg in large bulls (males) and are used to haul out of the water, to keep icy breathing holes open, and to fight and defend themselves against predators.

Do they face any threats?

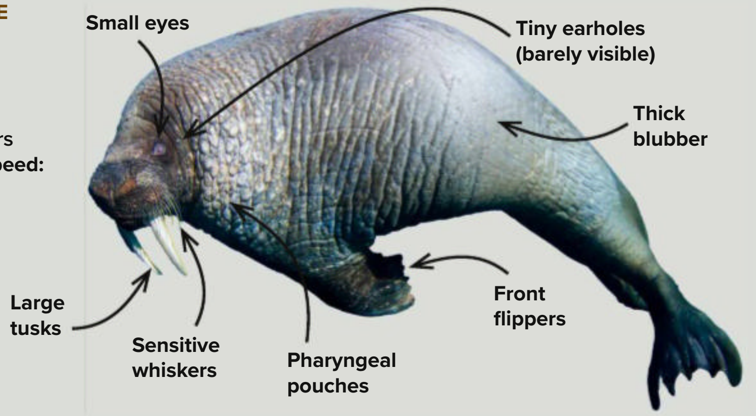
Global warming and sea-ice declines threaten populations because suitable areas for breeding and pupping are reduced, and access to offshore feeding areas becomes limited. Swimming further to find food requires more energy, leading to exhaustion and lower survival rates. A heavier reliance on land-based haul-out sites can result in deaths caused by overcrowding and an increased risk of stampedes. The reduction in sea ice has also led to expanded shipping and development of oil and gas fields in the creature's range, increasing the threat of spills, pollution discharge and disturbance.

Are walruses hunted?

Walrus populations were severely depleted by commercial hunting from the 18th to the mid-20th century, but the species now receives legal protection through international agreements and national laws. Today, subsistence harvests by native people continue in Canada, Greenland, Alaska and Russia.

A WALRUS'S SPECIAL FEATURES

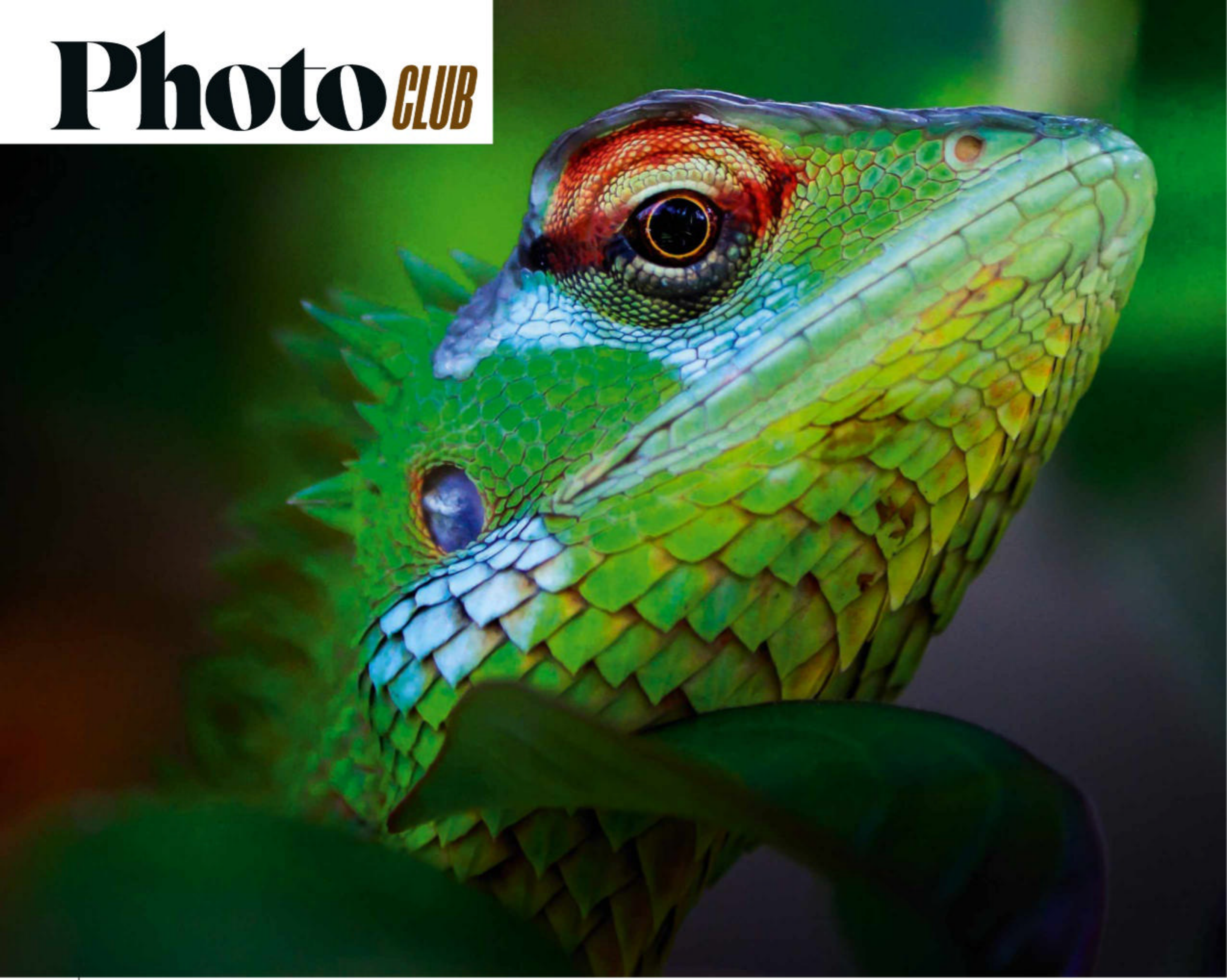
AT A GLANCE
Scientific family name:
Odobenidae
Lifespan:
Up to 40 years
Swimming speed:
Up to 35kph



NEXT MONTH

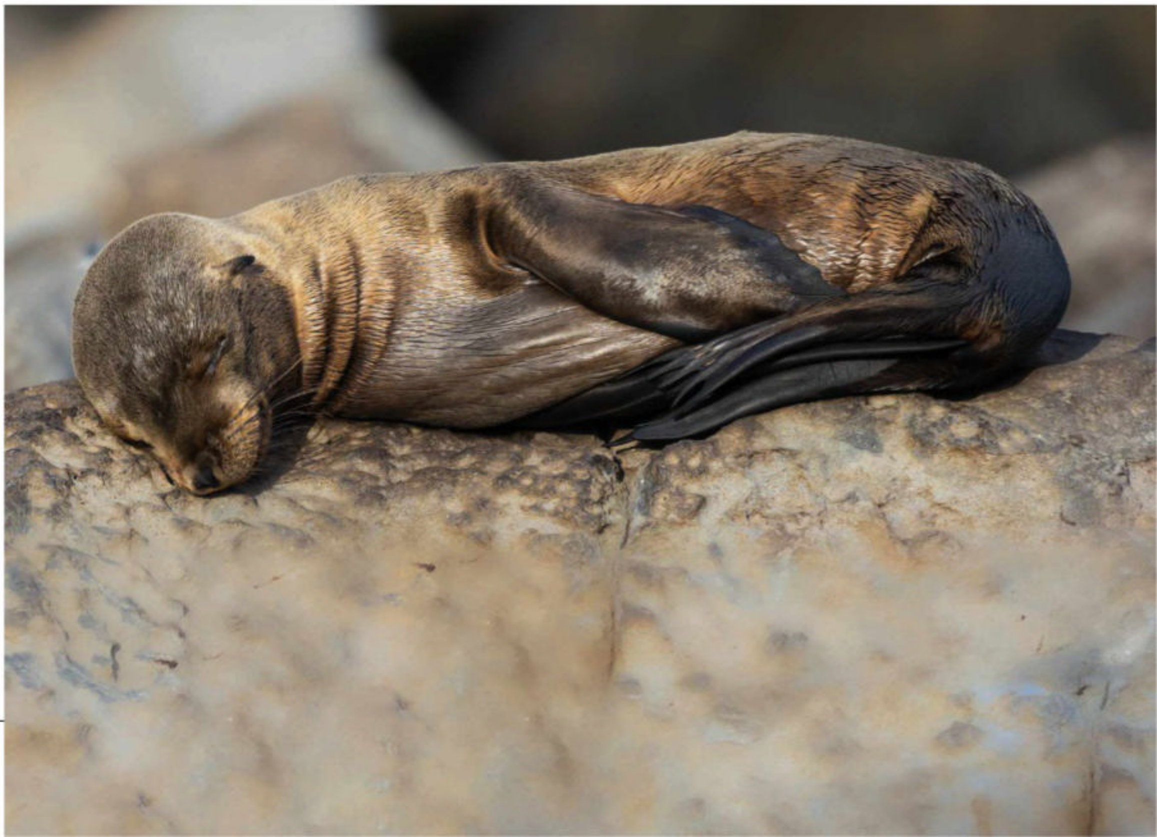
FLYING FOX
Large Old World fruit bat

WALRUS UNDERWATER: FRANCO BANFI/NATUREPL.COM; WALRUS TUSKS: WATERFRAME/ALAMY; MOTHER AND BABY: OLE JORGEN LIODDEN/NATUREPL.COM; WALRUS COLONY: IMAGEBROKER.COM/ALAMY; CUTOUT: WORLDFOTO/ALAMY; FLYING FOX: PAUL KENNEDY/ALAMY



Going green

The spineless forest lizard is one of four *Calotes* species endemic to Sri Lanka, all of which share common characteristics such as a short head, swollen cheeks and downwards-pointing scales.
Sasindu Pinibindu Maduwage, Sri Lanka

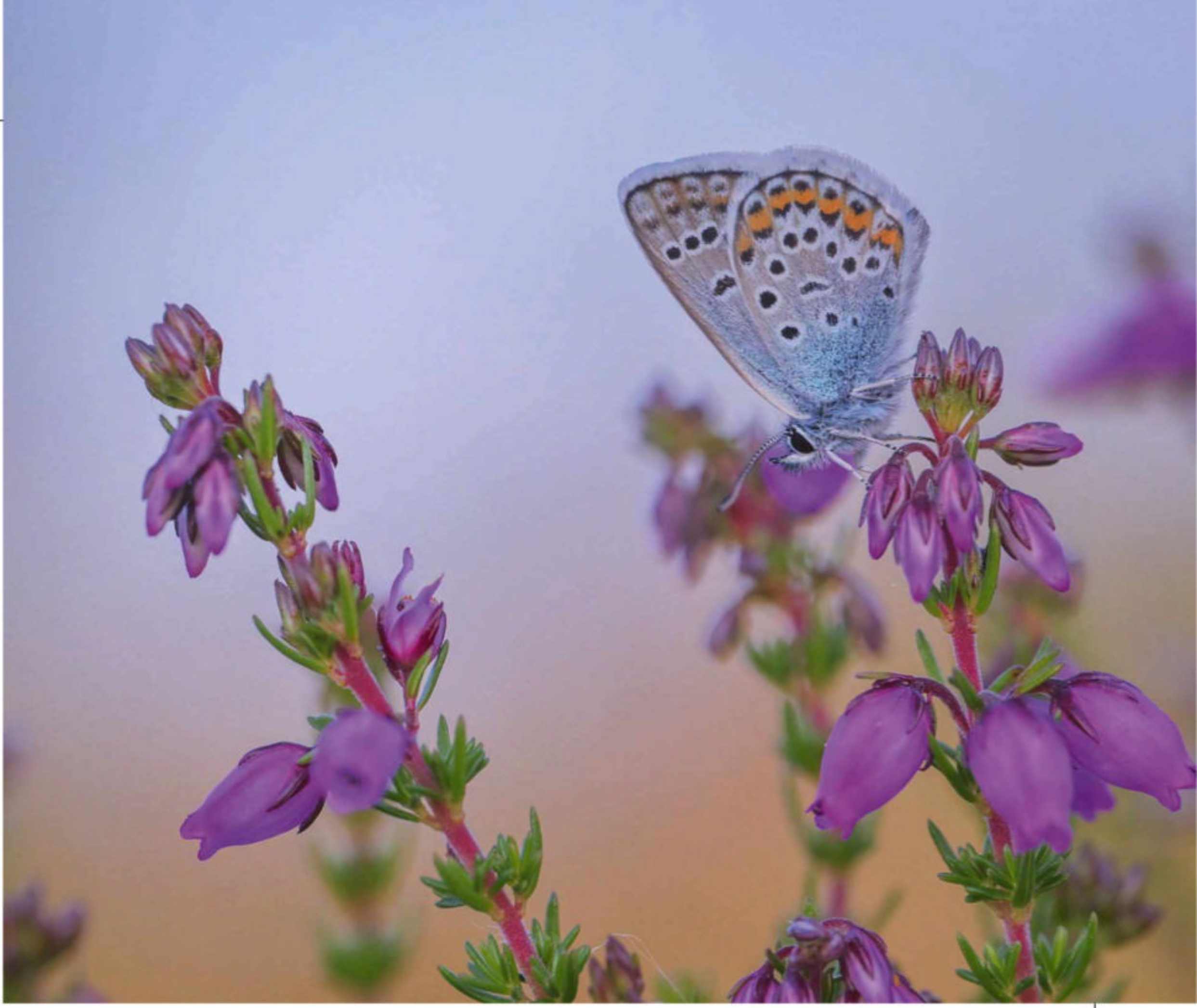


Sleep like a baby

We were watching sealions lazing on the rocks of a beach on San Cristóbal when I spotted this baby fast asleep. He hardly stirred, just stretching a flipper every now and again.
Jo Whiting, Galápagos Islands

SHARE!

Send your pics to **discoverwildlife.com/submit-your-photos** to see them in print!

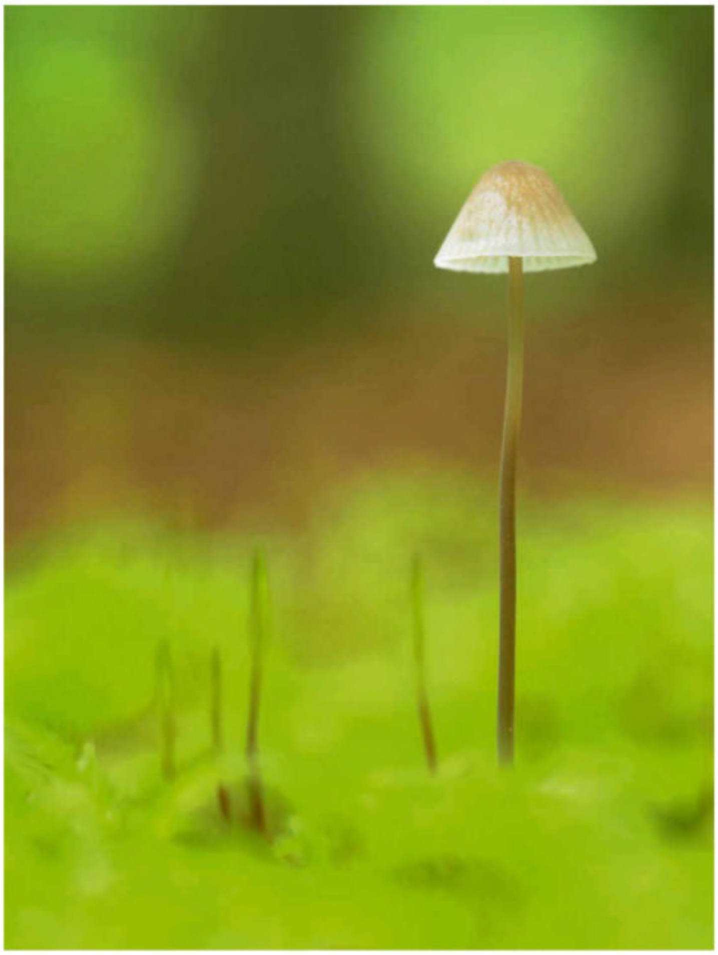


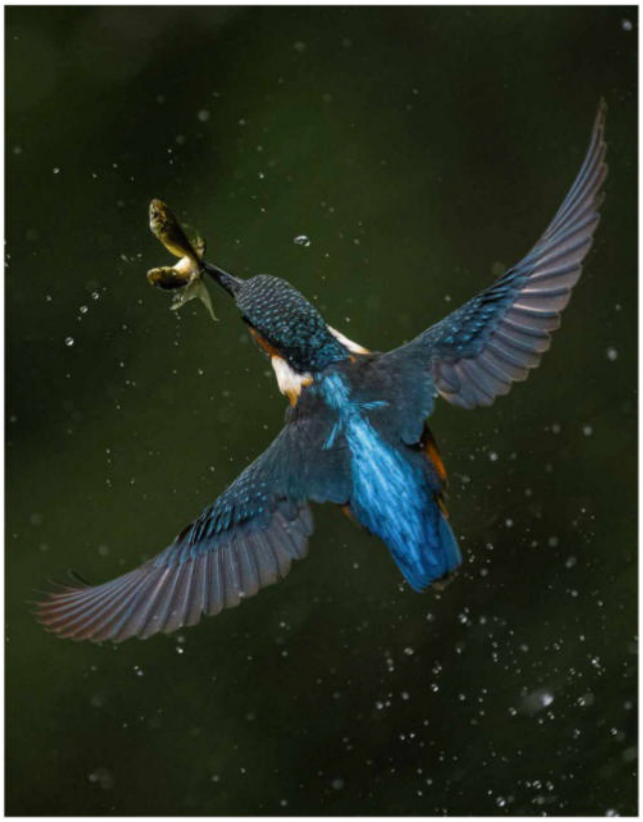
All of a flutter

I spent a wonderful evening watching silver-studded blue butterflies dance among the heather – here is a roosting male.
Verity Hill, Weymouth

Fragile fungus

This delicate *Mycena* stood alone on a mossy stump against a soft background of late summer beech trees in Stoke Park Wood.
Mike Blacknell, Hampshire





Double whammy

This kingfisher, fishing in a pond near the River Itchen, caught two fish in one dive. I only noticed this when I processed the picture.
John Moon, Maidenhead

Looking for pumas in Torres del Paine, Chile

SNAP-CHAT

THE INSIDE WORLD OF WILDLIFE PHOTOGRAPHY

Nick Garbutt is loving lemurs and big cats, but midges? No thanks

How did your career start?

While at university, I went on an expedition to Borneo to study proboscis monkeys. None of the team had any photography experience, so I borrowed a camera from my grandparents and became the 'expedition photographer'. I read an *Idiot's Guide* to photography on the plane and spent three months taking terrible pictures. But I was hooked.

Which of your images is most important to you?

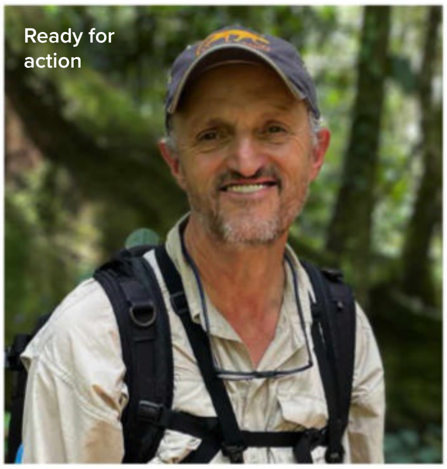
A photo of a tiger walking away, taken in Kanha National Park in India. It won the Gerald Durrell Endangered Wildlife category in the 2000 Wildlife Photographer of the Year competition. It really helped to raise my profile.

What's been your most memorable experience with wildlife?

The first time I saw a tiger in the wild, in 1985, in Kaziranga National Park in Assam. I can still remember seeing a tiger for the first time in a safari park when I was five or six years old, and being captivated. No other animal combines such beauty, aura and majesty. Even now, the hairs on the back of my neck bristle at the prospect of catching a glimpse of one in the wild.

What's been your hairiest shoot?

Years ago, during a night walk in Ecuador, I found a false coral snake. It was partially covered by vegetation, which I – stupidly – tried to remove for a photo. I was bitten and suffered 48 hours of excruciating pain and partial paralysis of my hand.



Ready for action

Any epic fails to share?

Back in the days of film, I travelled to a remote region in northern Madagascar to photograph the rare golden-crowned sifaka lemur. I had to trek miles at dawn to catch them in early light. On the first day, I took just two shots, came to the end of a roll, and realised I'd left all my spare rolls back at base.

Which species are on your bucket list?

I've photographed all seven of the world's big cats and many of the smaller species – I'm keen to keep adding to this list. Next year I hope to photograph a Pallas's cat for the first time. I'd also love to photograph a Gaboon viper in the wild.

What's been your biggest challenge?

I was once commissioned by a German magazine to take photos of the straw-coloured fruit bat migration to Kasanka National Park in Zambia. I had five days and hadn't visited the site previously. I was really under the cosh to come up with results. It opened my eyes to the way so many news, sports and some wildlife photographers must have to work all the time. My respect levels skyrocketed.

Do you regularly experience discomfort?

I've been frozen like an ice block, overheated to the point of melting and immersed in water for hours. But dealing with swarms of midges on a windless summer morning by a Scottish sea loch ranks among the worst.

What is a favourite species to focus on?

Over the past 30 years I've been obsessed with the wildlife of Madagascar, particularly the many species of lemur. But the island's largest carnivore, the cat-like fosa, is a favourite too. Until recently there were few decent images of the species. I've managed to get photos that are a bit different, including shots of one ascending a tree trunk coming towards the camera.

What item would you not be without?

At one time, without hesitation, I would have said my Really Right Stuff tripod, as I believed every shot should be taken on a rock-solid base. But now, high ISO performance is so good I'll happily take photos handheld in some circumstances.

Any top tips for budding photographers?

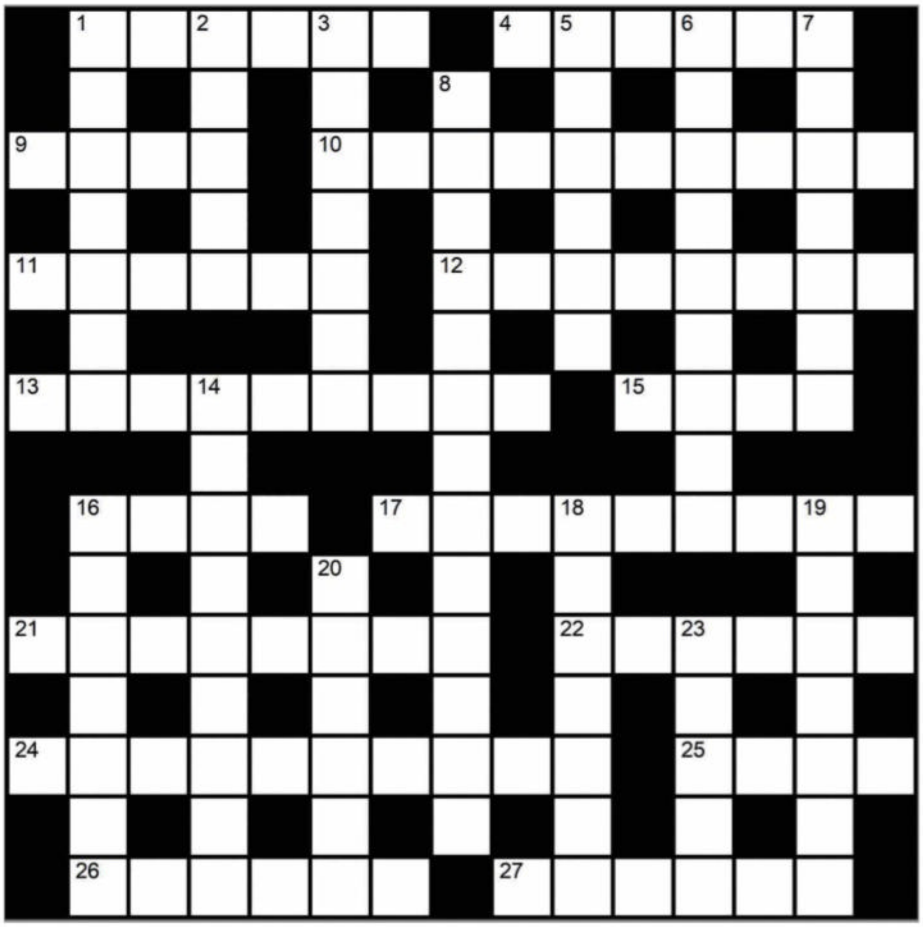
Don't expect overnight success. Develop a tough skin and don't take no for an answer. Find a niche or subject, no matter how small or specialised, that's not well covered and build a catalogue of images to showcase it from every angle and perspective.

Nick is a wildlife photographer, author and tour leader. See more at nickgarbutt.com

NICK WITH CAMERA: NICOLA MURPHY; PORTRAIT: ALEX HYDE

wild PUZZLES

The crossword



ACROSS
1 ___ crab, crustacean with a coat of soft hairs (6)
4 Herons that may be little or great white (6)
9 Jumping parasite (4)
10 Long-legged birds with spatulate beaks (10)
11 Swamphen of New Zealand (6)
12 Body of water in North America, home to a subspecies of northern watersnake (4,4)
13 Diving duck (9)
15 ___ tiger, Siberian subspecies (4)
16 Rounded marking, as seen on a leopard or ladybird (4)
17 Plant also known as great mullein (6,3)
21 Intestinal parasite (8)
22 Flightless parrot (6)
24 Insectivorous nocturnal bird of South America (5,5)
25 Scottish island noted for wildflowers and corncrakes (4)
26 African bird, also called an indigobird (6)
27 Milk organs, in some mammals (6)

DOWN
1 ___ swiftlets, bird of upland Indonesia (7)
2 Andean mammal (5)
3 ___ snake-eater, venomous snake of east and central Africa (7)
5 Ancient genus of non-flowering plants (6)
6 Outer skin (9)
7 ___ ant, combative member of a social insect colony (7)
8 Extinct ice age pachyderm (6,7)
14 One-humped camel (9)
16 Songbird that might be house or tree (7)
18 Forest of trees in the genus *Quercus* (7)
19 Flowers also known as live-forevers and witch's moneybags (7)
20 Herbaceous legume of Africa and Asia (6)
23 ___fish, fish with the ability to generate electrical charge (5)

April crossword

Across: 1 Rabbit warrens, 8 Ibis, 9 Ericaceous, 10 Anglia, 11 Edentate, 12 Cambodian, 14 Nene, 15 Bugs, 16 Blue poppy, 20 Breasted, 21 Hyssop, 23 Hammerhead, 24 Ibex, 25 Leatherjacket

Down: 1 Robinia, 2 Basil, 3 Iceland, 4 White-tailed deer, 5 Roared, 6 Eleuthero, 7 Scuttle, 13 Bog kalmia, 15 Bartail, 17 Echidna, 18 Project, 19 Starch, 22 Stick

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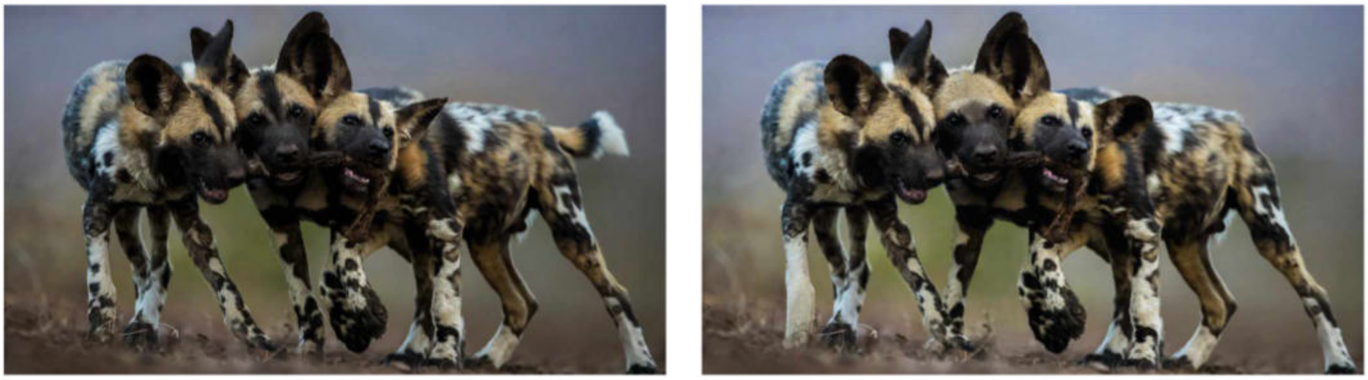
SPOT THE DIFFERENCE



These lively African wild dog juveniles – pictured here in Mkuze, South Africa – are playing with the leg of an impala, trying to drag it in three different directions. Can you spot all five differences between the two images? Turn to page 96 to find the answers.

CROSSWORD SET BY RICHARD SMYTH. AFRICAN WILD DOGS: BENCE MÁTÉ/NATUREPL.COM

Your LETTERS

Red grouse on heathland in north Wales

Driven grouse shooting

I completely agree with Mark Carwardine's opinion on grouse shooting (May 2025 issue). The law that is supposed to protect birds of prey against persecution is quite ineffective, because the nature of the crime makes it almost impossible to obtain the evidence required to secure a conviction unless the perpetrator is caught in the act. I would therefore go even further than Mark and call for all game-bird shooting (not just grouse) to be made illegal, as I believe that the only way to make the UK safe for birds of prey is to get rid of shooting estates altogether.
George W Henderson, Surrey

I disagree with the practice of driven grouse shoots for the same reasons outlined by Mr Carwardine. To this I would add a further environmental hazard to animals and people: pollution from lead pellets. The yearly killing of 500,000 grouse is reported, thus probably 1.5 million shots fired. With around 30g of lead shot per cartridge, perhaps 45 tonnes of lead per year are scattered about the moors, to remain permanently in the soil and water, which is terribly toxic to humans and animals alike.
Michael F Schultz, via email

Mark Carwardine's claim that upper heather moorland is "predominantly found in Britain (we harbour 75 per cent of the world total)" is completely false and is not supported by any scientific data on habitats published anywhere in the world. In fact, the UK does not even have anywhere near 75 per cent of upper heather moorland in Europe, let alone the world. But I am still with Mark: we need to get our wild, upper moorlands back.
Keith Dancey, Oxford

MARK CARWARDINE REPLIES:
There has been some debate about the widely quoted figure that the UK contains 75 per cent of the world's upland heather moorland. The figure does appear in several peer-reviewed papers, but the authority is Professor DBA Thompson's paper on the international importance of the UK's heather moorlands. While this scientific source does not contain an explicit figure of 75 per cent, visual assessment of his range map does support that three-quarters of upland heather moorland is in the UK. Some confusion arises because, in places where heather has been introduced, it is considered invasive and isn't included.

Zoos and more

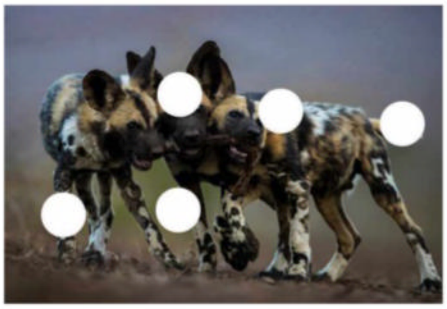
I would like to comment on two of the letters in the May edition. I have been a member of the Durrell Trust for more than 50 years and would heartily agree with Martin Knight. Jersey Zoo does a wonderful job in breeding species that are near extinction. The trust was, for example, responsible for preventing the extinction of the Mauritius kestrel and the pink pigeon. Martin is correct in that there is a germ of truth in what Born Free says but I have argued two or three times with a prominent member of its board of trustees that if it wasn't for places like Jersey Zoo, many more species would become extinct. Of course, we couldn't agree!

The Americas has been wonderful and of the high standard we have come to expect from the BBC Natural History Unit. However, it was made in conjunction with Universal Television Alternative Studio and was available to American viewers. So it seems sensible to choose an American as well-known as Tom Hanks to narrate the series. Yes, it may seem a bit Disneyesque to us this side of the Atlantic but we can't have Sir David forever and, as executive producer Mike Gunton has mentioned, some of these stories are quite intense and visceral and viewers "need their hands held sometimes". Tom Hanks does this admirably.
Myra Miller, via email

Mammoth de-extinction

I was extremely disappointed to see *BBC Wildlife* fall hook, line and sinker into the funding-driven media frenzy created by Colossal Biosciences (Wild Times, May 2025). Recreating the woolly mammoth is genetically impossible and ethically despicable.
Neil Hoskins, via email

PAUL McGUINNESS, EDITOR, REPLIES:
Thanks for your email, Neil. As we've discussed a number of times in these pages (for example, Helen Pilcher's examination of the subject in October 2024), the science of de-extinction is a controversial area, with strong opinions on all sides. It isn't our role to fall down on either side of the debate, though. Rather, we present the information – from all points of view – and leave it to you to make up your own minds.



Answers to Spot the Difference on page 95

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RED GROUSE: JACK WILLIAMS/ALAMY; AFRICAN WILD DOGS: BENCE MÁTÉ/NATUREPL.COM

BBC
wildlife

Cecil, a dominant male lion, was the focus of a long-running research project before his death

NEXT MONTH

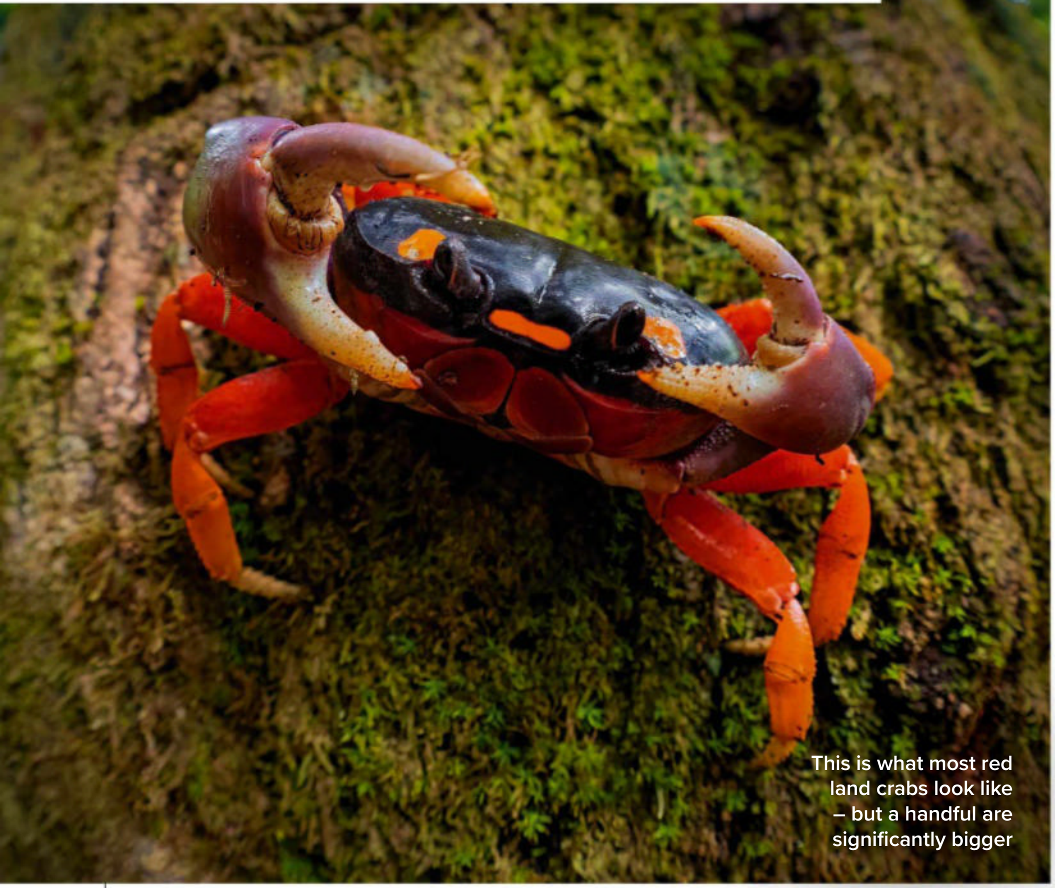
Long live the kings

For many years, Cecil the lion was the big-cat star attraction for visitors to Hwange National Park, Zimbabwe. Then, in 2015, he was shot by a trophy hunter with a bow and arrow, just outside the safety of the park border. A decade on, we look at how lions are faring across Africa, and how the loss of Cecil inspired a will to safeguard this iconic feline.

ON SALE
26th
JUNE

CECIL THE LION: PAULA FRENCH/ALAMY

Tales FROM THE BUSH



This is what most red land crabs look like – but a handful are significantly bigger

Giant crabs in Kuna Yala

“A colossal crab the size of a car tyre was pushing against my door”

BY SARAH WOODS

THE RED LAND CRAB IS A CURIOUS contradiction of part armoured warrior, part comedic crustacean. It’s found in the San Blas Islands (also known as Kuna Yala or Guna Yala) – a breathtaking stretch of paradise across 160km of Panama’s northern coast. The crab’s body, encased in a hard, segmented shell, ranges in colour from pinks and earthy reds to peachy deep browns. Beady, stalked eyes swivel with mischievous intelligence, and its many-jointed legs splay outwards, propelling it sideways in a rapid-fire staccato scuttle.

There is little grace in a crab’s movement, but there is undeniable efficiency. It darts, hesitates, then charges like a tiny gladiator. When startled, it freezes for a split-second before retreating into a burrow or crevice, as if the earth has swallowed it whole. Crabs are an enigma – and no more so than on these isles.

I had come to Kuna Yala to research a travel guide. I was staying on Uaguitupo, a ring-shaped coral island offering a handful of simple cabins. I was one of just six guests, alongside two Japanese travellers from Osaka and a family of three from the gleaming high-rises of Panama City. My rustic wooden abode, complete with woven palm-thatch walls, had a sand floor, a toilet, a cold-water shower pipe and bucket, and a small sink. The bed was covered in the trademark textile of the Kuna people: a reverse appliqué embroidery of layered cotton in bold, bright hues.

It was November, and a relentless heat pressed down. The night offered some relief, cooled by hours of drumming rain. Yet by dawn the humidity would rise again. One evening, the sky deepened into twilight, turning a dusky lavender splashed with cobalt and indigo. Stars appeared like silver pinpricks before the full moon took command, emitting an island-wide pearlescent sheen.

Back in my cabin, getting ready for bed, I felt Kuna Yala stir. I peered through the gaps in the cabin’s saloon-style doors to see a carpet of crabs, enlivened, I assumed, by the lunar phase. Like wind-up toys, they scuttled rapidly in manic synchronisation, their tiny legs scratching at the earth right outside my bedroom.

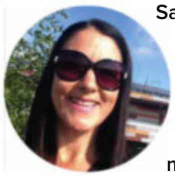
Thud. The sound disrupted the rhythm. Thud, again, and another, like a battering ram. My cabin was under siege.

A colossal crab the size of a car tyre was pushing against my door. Nobody knows why one in about 500 of Kuna Yala’s many land crabs grow to such monstrous proportions, but here was the proof. Its dark carapace gleamed in the moonlight as it waved its menacing pincers. With a final shove, my ‘guest’ crashed through the doors. It barrelled inside and ricocheted off the walls, disrupting the furniture.

Crash. Smash. Slam. The powerhouse crustacean sent my backpack skidding across the floor. My hiking boots caught on its claws and it clattered across the room, toppling a bucket. It rocked from side to side, on tip-toe, adopting an aggressive stance that made it appear even larger. In a final gesture, it lunged towards me, ramming the bed as I leapt on top of it. There was a tough-guy click of claws and the smaller crabs, which had followed their leader in, froze to the spot. Together, we stared, transfixed by the absurd spectacle.

Then, as suddenly as it had arrived, the giant crab turned to make its exit, giving my luggage another final shunt for good measure. The swinging doors snapped sharply against their hinges, rattling in its wake. The crab vanished into the night – until the next full moon.

ABOUT THE AUTHOR



Sarah is a travel writer, broadcaster and the author of various Bradt Guides. She is currently working on a documentary about the Andean condor. Find out more at sarahwoods.co.uk.

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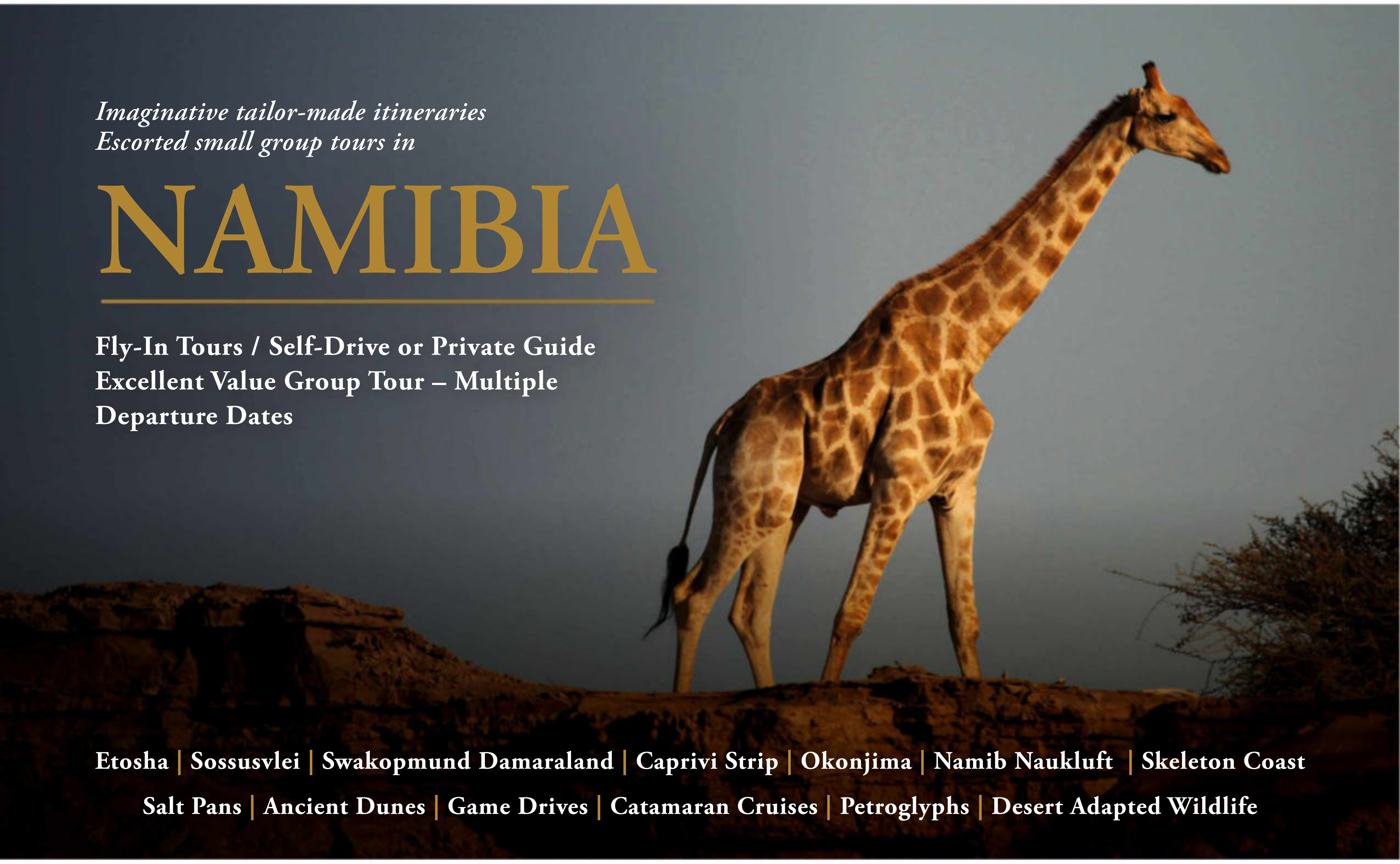

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